Sage OIL VAC WIND

GOEX Lube Trailer Owner's Manual

www.SageOilVac.com

877-645-8227

1 CUSTOMER SERVICE

1.1 WARRANTY SERVICE OR RETURNS

Call 1-877-645-8227 and select option 1 between the hours of 8am to 5pm CST.

1.2 ORDER PARTS

Call 1-877-645-8227 and select option 3 between the hours of 8am to 5pm CST.

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2.1 Safety Alert Symbols and Signal Words

This Owner's Manual does not cover all of the specific details necessary for every possible combination of trailer, tow vehicle, hitch and equipment. Therefore, you must read, understand and follow the instructions given by the tow vehicle, trailer hitch and equipment manufacturers, as well as the instructions in this manual.

Sage Oil Vac trailers are built with components produced by various manufacturers. Some of these items have separate instruction manuals. Where this manual indicates that you should read another manual, and you do not have that manual, contact Sage Oil Vac or your dealer for assistance.

The safety information in this manual is denoted by the safety alert symbol: ^

The level of risk is indicated by the following signal words.

^ DANGER

DANGER – Immediate hazards which WILL result in severe personal injury or death if the warning is ignored.

^ WARNING

WARNING – Hazards or unsafe practices which COULD result in severe personal injury or death if the warning is ignored.

^ CAUTION

CAUTION – Hazards or unsafe practices which could result in minor or moderate injury if the warning is ignored.

NOTICE

NOTICE – Practices that could result in damage to the trailer or other property.

2.2 Major Towing Hazards

Loss of control of the trailer or trailer/tow vehicle combination can result in death or serious injury. The most common causes for loss of control of the trailer are:

- Improper sizing the trailer for the tow vehicle, or vice versa.
- Excessive speed: Driving too fast for the conditions.
- Failure to adjust driving behavior when towing a trailer.
- Overloading and/or improper weight distribution.
- Improper or mis-coupling of the trailer to the hitch.
- Improper braking and steering under sway conditions.
- Not maintaining proper tire pressure.
- Not keeping lug nuts tight.

2.2.1 IMPROPER SIZING OF THE TRAILER TO THE TOW VEHICLE

Trailers that weigh too much for the towing vehicle can cause stability problems, which can lead to death or serious injury. Furthermore, the additional strain put on the engine and drive-train may lead to serious tow vehicle maintenance problems. For these reasons the maximum towing capacity of your towing vehicle should not be exceeded. The towing capacity of your tow vehicle, in terms of maximum Gross Trailer Weight (GTW) and maximum Gross Combined Weight Rating (GCWR) can be found in the tow vehicles Owner's Manual.

^ DANGER

Use of a tow vehicle with a towing capacity less than the Gross Vehicle Weight Rating of the trailer can result in loss of control, and may lead to death or serious injury.

Be sure your hitch and tow vehicle are rated for the Gross Vehicle Weight Rating of your trailer.

2.2.2 DRIVING TOO FAST

With ideal road conditions, the maximum recommended speed for safely towing a trailer is 60 mph. If you drive too fast, the trailer is more likely to sway, thus increasing the possibility for loss of control. Also your tires may overheat, thus increasing the possibility of a blowout.

^ WARNING

Driving too fast for conditions can result in loss of control and cause death or serious injury.

Decrease your speed when going downhill or as road, weather, and lighting conditions deteriorate.

2.2.3 FAILURE TO ADJUST DRIVING BEHAVIOR WHEN TOWING A TRAILER

When towing a trailer, you will have decreased acceleration, increased stopping distance, and increased turning radius (which means you must make wider turns to keep from hitting curbs, vehicles, and anything else that is on the inside corner). Furthermore the trailer will change the handling characteristics of your towing vehicle, making it more sensitive to steering inputs and more likely to be pushed around in windy conditions or when being passed by large vehicles. In addition, you will need a longer distance to pass, due to slower acceleration and increased length. With these caveats in mind:

- Be alert for slippery conditions. You are more likely to be affected by slippery road surfaces when driving a tow vehicle with a trailer, than driving a tow vehicle without a trailer.
- Anticipate the trailer "swaying." Swaying can be caused by excessive steering, wind gusts, roadway edges, or by the trailer reaction to the pressure wave created by passing trucks and busses.
- When encountering trailer sway take your foot off the gas, and steer as little as possible in order to stay on the road. Use small "trim-like" steering adjustments. Do not attempt to steer out of the sway; you'll only make it worse. Also do not apply the tow vehicle brakes to correct trailer swaying. On the other hand, application of the trailer brakes alone will tend to straighten out the combination, especially when going downhill.
- Check rearview mirrors frequently to observe the trailer and traffic.
- Use lower gear when driving down steep or long grades. Use the engine and transmission as a brake. Do not ride the brakes, as they can overheat and become ineffective.
- Be aware of your trailer height, especially when approaching bridges, roofed areas and around trees.

2.2.4 TRAILER NOT PROPERLY COUPLED TO THE HITCH

It is critical that the trailer be securely coupled to the hitch, and that the safety chains and emergency breakaway brake lanyard are correctly attached. Uncoupling may result in death or serious injury to you and to others.

^ WARNING

Proper selection and condition of the coupler and hitch are essential to safely towing your trailer. A loss of coupling may result in death or serious injury.

- **Be sure the maximum load rating of the hitch on the tow vehicle is equal to or greater than the maximum load rating of the coupler on the trailer.**
- **Be sure the hitch ball size matches the coupler size.**
- **Observe the hitch for wear, corrosion and cracks before coupling. Replace worn, corroded or cracked hitch components before coupling the trailer to the tow vehicle.**
- **Be sure the hitch components are tight before coupling the trailer to the tow vehicle.**

^ WARNING

An improperly coupled trailer can result in death or serious injury.

Do not move the trailer until:

- **The coupler is secured and locked to hitch ball or pintle;**
- **The safety chains are secured to the tow vehicle; and**
- **The trailer jacks are fully retracted.**

Do not tow the trailer on the road until:

- **Tires and wheels are checked;**
- **The trailer brakes are checked;**
- **The breakaway lanyard is connected to the tow vehicle;**
- **The load is secured to the trailer; and**
- **The trailer lights are connected and checked.**

2.2.5 PROPER USE OF SAFETY CHAINS

If your trailer comes loose from the hitch for any reason, we have provided safety chains so that control of the trailer can still be maintained.

^ WARNING

Improper rigging of the safety chains can result in loss of control of the trailer and tow vehicle, leading to death or serious injury, if the trailer uncouples from the tow vehicle.

- **Fasten chains to frame of tow vehicle. Do not fasten chains to any part of the hitch unless the hitch has holes or loops specifically for that purpose.**
- **Cross chains underneath hitch and coupler with enough slack to permit turning and to hold tongue up, if the trailer comes loose.**

2.2.6 MATCHING TRAILER AND HITCH

^ DANGER

Use of a hitch with a load rating less than the load rating of the trailer can result in loss of control and may lead to death or serious injury.

2.2.7 WORN TIRES, LOOSE WHEELS AND LUG NUTS

Just as with your tow vehicle, the trailer tires and wheels are important safety items. Therefore, it is essential to inspect the trailer tires before each tow.

If a tire has a bald spot, bulge, cut, cracks, or is showing any cords, replace the tire before towing. If a tire has uneven tread wear, take the trailer to a dealer service center for diagnosis. Uneven tread wear can be caused by tire imbalance, axle misalignment or incorrect inflation.

Tires with too little tread will not provide adequate frictional forces on wet roadways and can result in loss of control, leading to death or serious injury.

Improper tire pressure causes increased tire wear and may reduce trailer stability, which can result in a tire blowout or possible loss of control. Therefore, before each tow you must also check the tire pressure. Remember, the proper tire pressure is listed on the Certification / VIN label, normally mounted on front left side of the trailer, and should be checked when tires are cold. Allow 3 hours cool-down after driving as much as 1 mile at 40 mph before checking tire pressure.

^ WARNING

Improper tire pressure can result in a blowout and loss of control, which can lead to death or serious injury.

Be sure tires are inflated to pressure indicated on the Certification / VIN label before towing trailer.

The tightness of the lug nuts is very important in keeping the wheels properly seated to the hub. Before each tow, check to make sure they are tightened to the proper torque.

^ WARNING

Metal creep between the wheel rim and hub may cause lug nuts to loosen and could result in a wheel coming off, leading to death or serious injury.

Tighten lug nuts before each tow.

The proper tightness (torque) for lug nuts is listed in the Inspection, Service and Maintenance section of this manual. Use a torque wrench to tighten the lug nuts, use the crisscross star pattern.

Lug nuts are also prone to loosen after first being assembled. When driving a new trailer (or after wheels have been remounted), check to make sure they are tight after the **first** 10, 25 and 50 miles of driving and before each tow thereafter.

Failure to perform this check can result in a wheel separating from the trailer and a crash, leading to death or serious injury.

^ WARNING

Lug nuts are prone to loosen after initial installation, which can lead to death or serious injury.

Check lug nuts for tightness on a new trailer or when wheel(s) have been remounted after the first 10, 25 and 50 miles of driving.

^ WARNING

Improper lug nut torque can cause a wheel separating from the trailer, leading to death or serious injury.

Be sure lug nuts are tight before each tow.

2.2.8 IMPROPER LOADING

The total weight of the load you put on the trailer, plus the empty weight of the trailer itself, must not exceed the trailer's Gross Vehicle Weight Rating (GVWR). If you do not know the empty weight of the trailer plus the cargo weight, you must weigh the loaded trailer at a commercial scale. In addition, you must distribute the load in the trailer such that the load on any axle does not exceed the Gross Axle Weight Rating (GAWR). If your trailer is equipped with a Tire & Loading Information Placard, mounted next to the Certification / VIN label, the cargo capacity weight stated on that placard is only a close estimate. The GVWR and GAWR's are listed on the Certification / VIN label mounted on the front left side of the trailer.

^ WARNING

An overloaded trailer can result in loss of control of the trailer, leading to death or serious injury.

Do not exceed the trailer Gross Vehicle Weight Rating (GVWR) or an axle Gross Axle Weight Rating (GAWR).

Do not load a trailer so that the weight on any tire exceeds its rating.

2.2.9 SHIFTING CARGO

Since the trailer "ride" can be bumpy and rough, you must secure all cargo so that it does not shift while the trailer is being towed.

^ WARNING

Shifting cargo can result in loss of control of the trailer, and can lead to death or serious injury.

2.2.10 INAPPROPRIATE CARGO

Your trailer must not be used to carry certain items, such as people, containers of hazardous substances or containers of flammable substances.

^ WARNING

Do not transport people on the trailer.

The transport of people puts their lives at risk and is illegal.

2.2.11 INOPERABLE LIGHTS

Be sure that all of the lights on your trailer are functioning properly before towing your trailer.

^ WARNING

Improper electrical connection between the tow vehicle and the trailer will result in inoperable lights and can lead to collision.

Before each tow, check that the taillights, brake lights and turn signals work.

Standard mirrors usually do not provide adequate visibility for viewing traffic to the sides and rear a towed trailer. You must provide mirrors that allow you to safely observe approaching traffic.

2.2.12 HAZARDS FROM MODIFYING YOUR TRAILER

Essential safety items can be damaged by altering your trailer.

Before making any alteration to your trailer, contact your dealer or Sage oil Vac and describe the alteration you are contemplating. Alteration or modification of the trailer may void the warranty. Alteration or modification of the trailer structure must be performed only by qualified technicians with the written permission from Sage Oil Vac, Inc.

2.3 Oil Vac Equipment Hazards

Read and follow all of the instructions in this manual and the instructions provided by the manufacturer before operating the accessories.

2.3.1 Noise

Hearing protection must be worn while operating this machine. Failure to follow these instructions may result in hearing loss.

^ WARNING

Risk of hearing loss.

This machine produces extremely loud noise.

Hearing protection is required while operating this machine.

2.3.2 Pressurized Tanks

The new and used product tanks may be pressurized. Verify that all pressure is relieved before opening valves (unless offloading used product), removing filters or caps on tanks. Failure to do so could cause serious injury.

^ WARNING

Pressure hazard.

Relieve pressure before filling product tanks.

Failure to do so could cause serious injury.

2.3.3 Hoses And Fittings

The hoses and fittings on your Sage Oil Vac may get extremely hot during operation. Contact with these parts may cause serious burns.

^ WARNING

Burn hazard.

Hoses and fittings may be extremely hot during operation

Contact with these parts may cause serious burns.

2.3.4 COMPRESSOR

Before operating the compressor, you must read and fully understand the compressor manufacturer's instructions. If you do not have the manufacturers' instructions, contact Sage Oil Vac or your dealer for assistance.

Carbon Monoxide is an odorless gas that can cause death. Avoid any actions or areas that expose you to carbon monoxide.

^ WARNING

Operating the compressor can lead to death or serious injury by:

- **Carbon Monoxide**
- **Fire and Explosion**

Avoid any actions or areas that expose you to carbon monoxide.

Do not refuel a running compressor or refuel near ignition sources.

^ WARNING

The exhaust from this engine contains chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.

^ WARNING

Risk of fire or explosion.

Do not smoke or use an open flame within 50 feet of the unit.

Verify that correct grounding procedures have been followed prior to operation.

If fluid is spilled, stop operation and notify safety personnel.

2.3.5 SAFETY WARNING LABELS

WARNING
BURN HAZARD
Hoses and Fittings may be extremely hot during operation.
Contact with these parts may cause serious burns.

Figure 1 – Located On Top Of Used Filter Receptacle

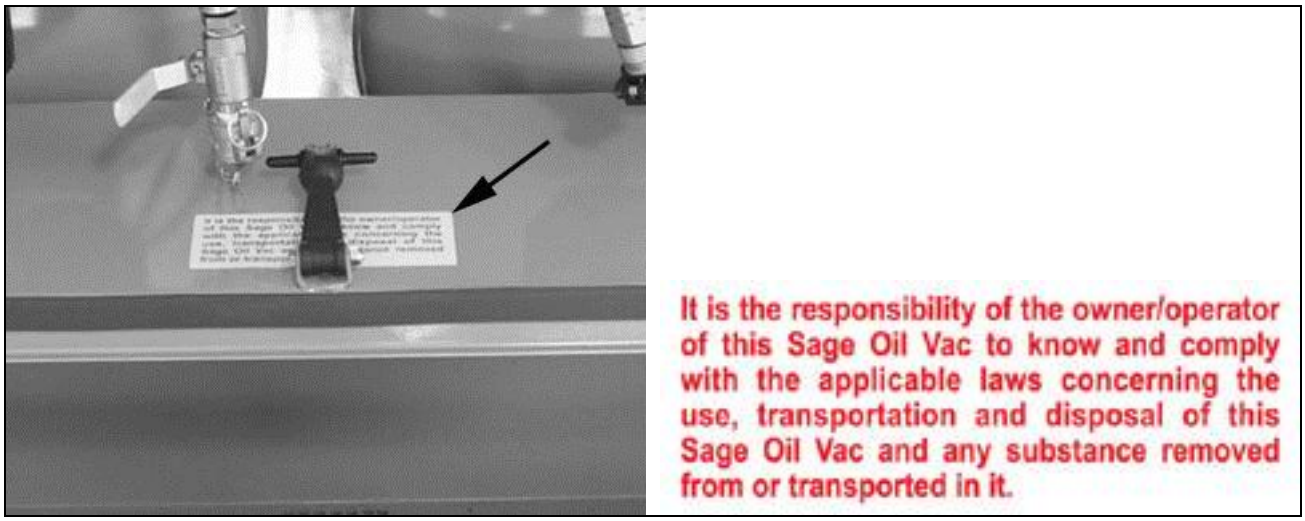
It is the responsibility of the owner/operator of this Sage Oil Vac to know and comply with the applicable laws concerning the use, transportation and disposal of this Sage Oil Vac and any substance removed from or transported in it.

Figure 2 – Located On Top Of Used Filter Receptacle

Figure 3 – Located On Top Of Used Filter Receptacle

Figure 4 – Located On Top Of Used Filter Receptacle

Figure 5 – Located On Top Of New Product Tank by 2" Ball Valve

USED PRODUCT
WARNING
NOISE HAZARD
This machine produces extremely loud noise.
Hearing protection is required while operating this machine.
Failure to follow these instructions may result in HEARING LOSS.
WARNING
NOISE HAZARD
This machine produces extremely loud noise.
Hearing protection is required while operating this machine.
Failure to follow these instructions may result in HEARING LOSS.

Figure 6 – Located On Used Product Tank

^ WARNING

To protect you and others against death or serious injury, all of the labels shown must be on the equipment and must be legible.

If any of these labels are missing or cannot be read, call Sage Oil Vac, Inc. at 806-372-7559 or dealer for replacement labels.

2.4 TRAILER TOWING GUIDE

Driving a vehicle with a trailer in tow is vastly different from driving the same vehicle without a trailer in tow. Acceleration, maneuverability and braking are all diminished with a trailer in tow. It takes longer to get up to speed; you need more room to turn and pass, and more distance to stop when towing a trailer. You will need to spend time adjusting to the different feel and maneuverability of the tow vehicle with a trailer. Because of the significant differences in all aspects of maneuverability when towing a trailer, the hazards and risks of injury are also much greater than when driving without a trailer. You are responsible for keeping your vehicle and trailer in control, and for all the damage that is caused if you lose control of your vehicle and trailer.

As you did when learning to drive an automobile, find an open area with little or no traffic for your first practice towing. Of course, before you start towing the trailer, you must follow all of the instructions for inspection, testing, loading and coupling. Also, before you start towing, adjust the mirrors so you can see the trailer as well as the area to the rear of it.

Drive slowly at first, 5 mph or so, and turn the wheel to get the feel of how the tow vehicle and trailer combination responds. Next, make some right and left hand turns. Watch in your side mirrors to see how the trailer follows the tow vehicle. Turning with a trailer attached requires more room.

Stop the rig a few times from speeds no greater than 10 mph.

It will take practice to learn how to back up a tow vehicle with a trailer attached. Take it slow. Before backing up, get out of the tow vehicle and look behind the trailer to make sure that there are no obstacles. Some drivers place their hands at the bottom of the steering wheel, and while the tow vehicle is in reverse, “think” of the hands as being on the top of the wheel. When the hands move to the right (counter-clockwise, as you would do to turn the tow vehicle to the left when moving forward), the rear of the trailer moves to the right. Conversely, rotating the steering wheel clockwise with your hands at the bottom of the wheel will move the rear of the trailer to the left, while backing up. If you are towing a bumper hitch rig, be careful not to allow the trailer to turn too much, because it will hit the rear of the tow vehicle. To straighten the rig, either pull forward, or turn the steering wheel in the opposite direction.

2.4.1 SAFE TRAILER TOWING GUIDELINES

- Recheck the load tie downs to make sure the load will not shift during towing.
- Before towing, check coupling, safety chains, tires, wheels and lights.
- Check the lug nuts for proper tightness.
- Check coupler tightness after towing 50 miles.
- Use your mirrors to verify that you have room to change lanes or pull into traffic.
- Use your turn signals well in advance.
- Allow plenty of stopping space for your trailer and tow vehicle.
- Do not drive so fast that the trailer begins to sway due to speed. Generally never drive faster than 60 m.p.h.
- Allow plenty of room for passing. A rule of thumb is that the passing distance with a trailer is 4 times the passing distance without a trailer.
- Use lower gears for climbing and descending grades.
- Do not ride the brakes while descending grades; they may get so hot that they stop working, then you will potentially have a runaway tow vehicle and trailer.

- To conserve fuel, don't use full throttle to climb a hill. Instead, build speed on the approach.
- Slow down for bumps in the road. Take your foot off the brake when crossing the bump.
- Do not brake while in a curve unless absolutely necessary. Instead, slow down before you enter the curve.
- Do not apply the tow vehicle brakes to correct extreme trailer swaying.
- Make regular stops, about once each hour. Confirm that
  - The coupler is secure to the hitch and is locked,
  - Electrical connections are made,
  - There is appropriate slack in the safety chains,
  - The tires are not visibly low on pressure, and
  - The cargo is secure and in good condition.

2.5 Reporting Safety Defects

If you believe that your vehicle has a defect that could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying Sage Oil Vac, Inc.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or Sage Oil Vac, Inc.

To contact NHTSA, you may either call the Vehicle Safety Hotline toll-free at 1-888-327-4236 (TTY: 1-800-424-9153), go to http://www.safecar.gov; or write to: Administrator, NHTSA, 400 Seventh Street, SW., Washington, DC 20590. You can also obtain other information about motor vehicle safety from http://www.safecar.gov.

3 TIRE SAFETY INFORMATION

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This portion of the User's Manual contains tire safety information as required by 49 CFR 575.6.

Section 1 contains "Steps for Determining Correct Load Limit - Trailer".

Section 2 contains "Steps for Determining Correct Load Limit – Tow Vehicle".

Section 3 contains a Glossary of Tire Terminology, including "cold inflation pressure", "maximum inflation pressure", "recommended inflation pressure", and other non-technical terms.

Section 4 contains information from the NHTSA brochure entitled "Tire Safety – Everything Rides On It".
This brochure describes the following items;

- Tire labeling, including a description and explanation of each marking on the tires, and information about the DOT Tire Identification Number (TIN).
- Recommended tire inflation pressure, including a description and explanation of:
  A. Cold inflation pressure.
  B. Vehicle Placard and location on the vehicle.
  C. Adverse safety consequences of under inflation (including tire failure).
  D. Measuring and adjusting air pressure for proper inflation.
- Tire Care, including maintenance and safety practices.
- Vehicle load limits, including a description and explanation of the following items:
  A. Locating and understanding the load limit information, total load capacity, and cargo capacity.
  B. Calculating total and cargo capacities with varying seating configurations including quantitative examples showing / illustrating how the vehicles cargo and luggage capacity decreases as combined number and size of occupants' increases. This item is also discussed in Section 3.
  C. Determining compatibility of tire and vehicle load capabilities.
  D. Adverse safety consequences of overloading on handling and stopping on tires.

3.1 Steps for Determining Correct Load Limit – Trailer

3.1.1 Trailers 10,000 Pounds GVWR or Less

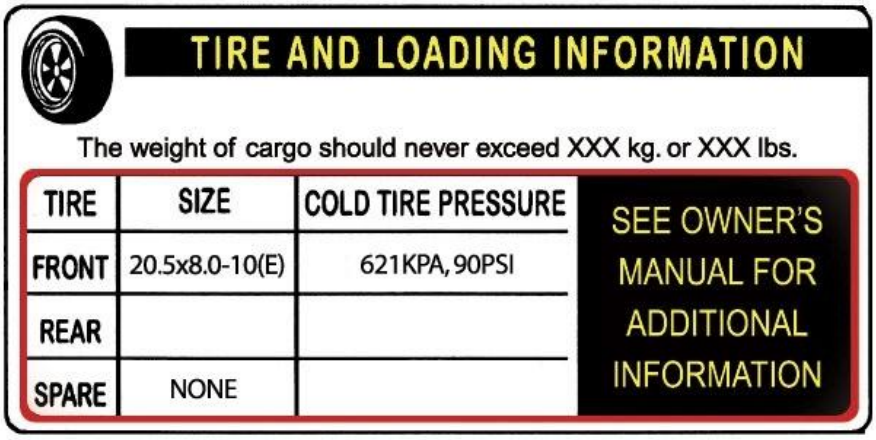


Figure 2-1 - Tire and Loading Placard

1. Locate the statement, "The weight of cargo should never exceed XXX kg or XXX lbs.," on your vehicle's placard. See figure 2-1.
2. This figure equals the available amount of cargo and luggage load capacity.
3. Determine the combined weight of luggage and cargo being loaded on the vehicle. That weight may not safely exceed the available cargo and luggage load capacity.

The trailer's placard refers to the Tire Information Placard attached adjacent to or near the trailer's VIN (Certification) label on the left front of the trailer.

3.1.2 Trailers Over 10,000 Pounds GVWR

Note: These trailers are not required to have a tire information placard on the vehicle.

1. Determine the empty weight of your trailer by weighing the trailer using a public scale or other means. This step does not have to be repeated.
2. Locate the GVWR (Gross Vehicle Weight Rating) of the trailer on your trailer's VIN (Certification) label.
3. Subtract the empty weight of your trailer from the GVWR stated on the VIN label. That weight is the maximum available cargo capacity of the trailer and may not be safely exceeded.

3.2 Steps for Determining Correct Load Limit – Tow Vehicle

1. Locate the statement, "The combined weight of occupants and cargo should never exceed XXX lbs.," on your vehicle's placard.
2. Determine the combined weight of the driver and passengers who will be riding in your vehicle.
3. Subtract the combined weight of the driver and passengers from XXX kilograms or XXX pounds.
4. The resulting figure equals the available amount of cargo and luggage capacity. For example, if the "XXX" amount equals 1400 lbs. and there will be five 150 lb. passengers in your vehicle, the amount of available cargo and luggage capacity is 650 lbs. (1400-750 (5 x 150) = 650 lbs.).
5. Determine the combined weight of luggage and cargo being loaded on the vehicle. That weight may not safely exceed the available cargo and luggage capacity calculated in Step # 4.
6. If your vehicle will be towing a trailer, load from your trailer will be transferred to your vehicle. Consult the tow vehicle's manual to determine how this weight transfer reduces the available cargo and luggage capacity of your vehicle.

3.3 Glossary Of Tire Terminology

Accessory weight
The combined weight (in excess of those standard items which may be replaced) of automatic transmission, power steering, power brakes, power windows, power seats, radio and heater, to the extent that these items are available as factory-installed equipment (whether installed or not).

Bead
The part of the tire that is made of steel wires, wrapped or reinforced by ply cords and that is shaped to fit the rim.

Bead separation
This is the breakdown of the bond between components in the bead.

Bias ply tire
A pneumatic tire in which the ply cords that extend to the beads are laid at alternate angles substantially less than 90 degrees to the centerline of the tread.

Carcass
The tire structure, except tread and sidewall rubber which, when inflated, bears the load.

Chunking
The breaking away of pieces of the tread or sidewall.

Cold inflation pressure
The pressure in the tire before you drive.

Cord
The strands forming the plies in the tire.

Cord separation
The parting of cords from adjacent rubber compounds.

Cracking
Any parting within the tread, sidewall, or inner liner of the tire extending to cord material.

CT
A pneumatic tire with an inverted flange tire and rim system in which the rim is designed with rim flanges pointed radially inward and the tire is designed to fit on the underside of the rim in a manner that encloses the rim flanges inside the air cavity of the tire.

Curb weight
The weight of a motor vehicle with standard equipment including the maximum capacity of fuel, oil, and coolant, and, if so equipped, air conditioning and additional weight optional engine.

Extra load tire
A tire designed to operate at higher loads and at higher inflation pressures than the corresponding standard tire.

Groove
The space between two adjacent tread ribs.

Innerliner
The layer(s) forming the inside surface of a tubeless tire that contains the inflating medium within the tire.

Innerliner separation
The parting of the innerliner from cord material in the carcass.

Intended outboard sidewall
The sidewall that contains a white-wall, bears white lettering or bears manufacturer, brand, and/or model name molding that is higher or deeper than the same molding on the other sidewall of the tire or the outward facing sidewall of an asymmetrical tire that has a particular side that must always face outward when mounted on a vehicle.

Light truck (LT) tire
A tire designated by its manufacturer as primarily intended for use on lightweight trucks or multipurpose passenger vehicles.

Load rating
The maximum load that a tire is rated to carry for a given inflation pressure.

Maximum load rating
The load rating for a tire at the maximum permissible inflation pressure for that tire.

Maximum permissible inflation pressure
The maximum cold inflation pressure to which a tire may be inflated.

Maximum loaded vehicle weight
The sum of curb weight, accessory weight, vehicle capacity weight, and production options weight.

Measuring rim
The rim on which a tire is fitted for physical dimension requirements.

Non-pneumatic rim
A mechanical device which, when a non-pneumatic tire assembly incorporates a wheel, supports the tire, and attaches, either integrally or separably, to the wheel center member and upon which the tire is attached.

Non-pneumatic spare tire assembly
A non-pneumatic tire assembly intended for temporary use in place of one of the pneumatic tires and rims that are fitted to a passenger car in compliance with the requirements of this standard.

Non-pneumatic tire
A mechanical device which transmits, either directly or through a wheel or wheel center member, the vertical load and tractive forces from the roadway to the vehicle, generates the tractive forces that provide the directional control of the vehicle and does not rely on the containment of any gas or fluid for providing those functions.

Non-pneumatic tire assembly
A non-pneumatic tire, alone or in combination with a wheel or wheel center member, which can be mounted on a vehicle.

Normal occupant weight
This means 68 kilograms (150 lbs.) times the number of occupants specified in the second column of Table I of 49 CFR 571.110.

Occupant distribution
The distribution of occupants in a vehicle as specified in the third column of Table I of 49 CFR 571.110.

Open splice
Any parting at any junction of tread, sidewall, or innerliner that extends to cord material.

Outer diameter
The overall diameter of an inflated new tire.

Overall width
The linear distance between the exteriors of the sidewalls of an inflated tire, including elevations due to labeling, decorations, or protective bands or ribs.

Ply
A layer of rubber-coated parallel cords.

Ply separation
A parting of rubber compound between adjacent plies.

Pneumatic tire
A mechanical device made of rubber, chemicals, fabric and steel or other materials, that, when mounted on an automotive wheel, provides the traction and contains the gas or fluid that sustains the load.

Production options weight
The combined weight of those installed regular production options weighing over 2.3 kilograms (5 lbs.) in excess of those standard items which they replace, not previously considered in curb weight or accessory weight, including heavy duty brakes, ride levelers, roof rack, heavy duty battery, and special trim.

Radial ply tire
A pneumatic tire in which the ply cords that extend to the beads are laid at substantially 90 degrees to the centerline of the tread.

Recommended inflation pressure
This is the inflation pressure provided by the vehicle manufacturer on the Tire Information label and on the Certification / VIN tag.

Reinforced tire
A tire designed to operate at higher loads and at higher inflation pressures than the corresponding standard tire.

Rim
A metal support for a tire or a tire and tube assembly upon which the tire beads are seated.

Rim diameter
This means the nominal diameter of the bead seat.

Rim size designation
This means the rim diameter and width.

Rim type designation
This means the industry of manufacturer's designation for a rim by style or code.

Rim width
This means the nominal distance between rim flanges.

Section width
The linear distance between the exteriors of the sidewalls of an inflated tire, excluding elevations due to labeling, decoration, or protective bands.

Sidewall
That portion of a tire between the tread and bead.

Sidewall separation
The parting of the rubber compound from the cord material in the sidewall.

Special Trailer (ST) tire
The "ST" is an indication the tire is for trailer use only.

Test rim
The rim on which a tire is fitted for testing, and may be any rim listed as appropriate for use with that tire.

Tread
That portion of a tire that comes into contact with the road.

Tread rib
A tread section running circumferentially around a tire.

Tread separation
Pulling away of the tread from the tire carcass.

Treadwear indicators (TWI)
The projections within the principal grooves designed to give a visual indication of the degrees of wear of the tread.

Vehicle capacity weight
The rated cargo and luggage load plus 68 kilograms (150 lbs.) times the vehicle's designated seating capacity.

Vehicle maximum load on the tire
The load on an individual tire that is determined by distributing to each axle its share of the maximum loaded vehicle weight and dividing by two.

Vehicle normal load on the tire
The load on an individual tire that is determined by distributing to each axle its share of the curb weight, accessory weight, and normal occupant weight (distributed in accordance with Table I of CRF 49 571.110) and dividing by 2.

Weather side
The surface area of the rim not covered by the inflated tire.

Wheel center member
In the case of a non-pneumatic tire assembly incorporating a wheel, a mechanical device which attaches, either integrally or separably, to the non-pneumatic rim and provides the connection between the non-pneumatic rim and the vehicle; or, in the case of a non-pneumatic tire assembly not incorporating a wheel, a mechanical device which attaches, either integrally or separably, to the non-pneumatic tire and provides the connection between tire and the vehicle.

Wheel-holding fixture
The fixture used to hold the wheel and tire assembly securely during testing.

3.4 TIRE SAFETY - EVERYTHING RIDES ON IT

The National Traffic Safety Administration (NHTSA) has published a brochure (DOT HS 809 361) that discusses all aspects of Tire Safety, as required by CFR 575.6. This brochure is reproduced in part below. It can be obtained and downloaded from NHTSA, free of charge, from the following web site:

http://www.nhtsa.dot.gov/cars/rules/TireSafety/ridesonit/tires_index.html

Studies of tire safety show that maintaining proper tire pressure, observing tire and vehicle load limits (not carrying more weight in your vehicle than your tires or vehicle can safely handle), avoiding road hazards, and inspecting tires for cuts, slashes, and other irregularities are the most important things you can do to avoid tire failure, such as tread separation or blowout and flat tires. These actions, along with other care and maintenance activities, can also:

- Improve vehicle handling
- Help protect you and others from avoidable breakdowns and accidents
- Improve fuel economy
- Increase the life of your tires.

This booklet presents a comprehensive overview of tire safety, including information on the following topics:

- Basic tire maintenance
- Uniform Tire Quality Grading System
- Fundamental characteristics of tires
- Tire safety tips.

Use this information to make tire safety a regular part of your vehicle maintenance routine. Recognize that the time you spend is minimal compared with the inconvenience and safety consequences of a flat tire or other tire failure.

3.4.1 SAFETY FIRST–BASIC TIRE MAINTENANCE

Properly maintained tires improve the steering, stopping, traction, and load-carrying capability of your vehicle. Underinflated tires and overloaded vehicles are a major cause of tire failure. Therefore, as mentioned above, to avoid flat tires and other types of tire failure, you should maintain proper tire pressure, observe tire and vehicle load limits, avoid road hazards, and regularly inspect your tires.

3.4.2 FINDING YOUR VEHICLE'S RECOMMENDED TIRE PRESSURE AND LOAD LIMITS

Tire information placards and vehicle certification labels contain information on tires and load limits. These labels indicate the vehicle manufacturer's information including:

- Recommended tire size
- Recommended tire inflation pressure
- Vehicle capacity weight (VCW–the maximum occupant and cargo weight a vehicle is designed to carry)
- Front and rear gross axle weight ratings (GAWR– the maximum weight the axle systems are designed to carry).

Both placards and certification labels are permanently attached to the trailer near the left front.

3.4.3 UNDERSTANDING TIRE PRESSURE AND LOAD LIMITS

Tire inflation pressure is the level of air in the tire that provides it with load-carrying capacity and affects the overall performance of the vehicle. The tire inflation pressure is a number that indicates the amount of air pressure– measured in pounds per square inch (psi)–a tire requires to be properly inflated. (You will also find this number on the vehicle information placard expressed in kilopascals (kPa), which is the metric measure used internationally.)
Manufacturers of passenger vehicles and light trucks determine this number based on the vehicle's design load limit, that is, the greatest amount of weight a vehicle can safely carry and the vehicle's tire size. The proper tire pressure for your vehicle is referred to as the "recommended cold inflation pressure." (As you will read below, it is difficult to obtain the recommended tire pressure if your tires are not cold.)
Because tires are designed to be used on more than one type of vehicle, tire manufacturers list the "maximum permissible inflation pressure" on the tire sidewall. This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions.

3.4.4 Checking Tire Pressure

It is important to check your vehicle's tire pressure at least once a month for the following reasons:

- Most tires may naturally lose air over time.
- Tires can lose air suddenly if you drive over a pothole or other object or if you strike the curb when parking.
- With radial tires, it is usually not possible to determine underinflation by visual inspection.

For convenience, purchase a tire pressure gauge to keep in your vehicle. Gauges can be purchased at tire dealerships, auto supply stores, and other retail outlets.
The recommended tire inflation pressure that vehicle manufacturers provide reflects the proper psi when a tire is cold. The term cold does not relate to the outside temperature. Rather, a cold tire is one that has not been driven on for at least three hours. When you drive, your tires get warmer, causing the air pressure within them to increase. Therefore, to get an accurate tire pressure reading, you must measure tire pressure when the tires are cold or compensate for the extra pressure in warm tires.

3.4.5 Steps for Maintaining Proper Tire Pressure

- Step 1: Locate the recommended tire pressure on the vehicle's tire information placard, certification label, or in the owner's manual.
- Step 2: Record the tire pressure of all tires.
- Step 3: If the tire pressure is too high in any of the tires, slowly release air by gently pressing on the tire valve stem with the edge of your tire gauge until you get to the correct pressure.
- Step 4: If the tire pressure is too low, note the difference between the measured tire pressure and the correct tire pressure. These "missing" pounds of pressure are what you will need to add.
- Step 5: At a service station, add the missing pounds of air pressure to each tire that is underinflated.
- Step 6: Check all the tires to make sure they have the same air pressure (except in cases in which the front and rear tires are supposed to have different amounts of pressure).

If you have been driving your vehicle and think that a tire is underinflated, fill it to the recommended cold inflation pressure indicated on your vehicle's tire information placard or certification label. While your tire may still be slightly underinflated due to the extra pounds of pressure in the warm tire, it is safer to drive with air pressure that is slightly lower than the vehicle manufacturer's recommended cold inflation pressure than to drive with a significantly underinflated tire. Since this is a temporary fix, don't forget to recheck and adjust the tire's pressure when you can obtain a cold reading.

3.4.6 Tire Size

To maintain tire safety, purchase new tires that are the same size as the vehicle's original tires or another size recommended by the manufacturer. Look at the tire information placard, the owner's manual, or the sidewall of the tire you are replacing to find this information. If you have any doubt about the correct size to choose, consult with the tire dealer.

3.4.7 Tire Tread

The tire tread provides the gripping action and traction that prevent your vehicle from slipping or sliding, especially when the road is wet or icy. In general, tires are not safe and should be replaced when the tread is worn down to 1/16 of an inch. Tires have built-in tread wear indicators that let you know when it is time to replace your tires. These indicators are raised sections spaced intermittently in the bottom of the tread grooves. When they appear "even" with the outside of the tread, it is time to replace your tires. Another method for checking tread depth is to place a penny in the tread with Lincoln's head upside down and facing you. If you can see the top of Lincoln's head, you are ready for new tires.

3.4.8 Tire Balance and Wheel Alignment

To avoid vibration or shaking of the vehicle when a tire rotates, the tire must be properly balanced. This balance is achieved by positioning weights on the wheel to counterbalance heavy spots on the wheel-and-tire assembly. A wheel alignment adjusts the angles of the wheels so that they are positioned correctly relative to the vehicle's frame. This adjustment maximizes the life of your tires. These adjustments require special equipment and should be performed by a qualified technician.

3.4.9 TIRE REPAIR

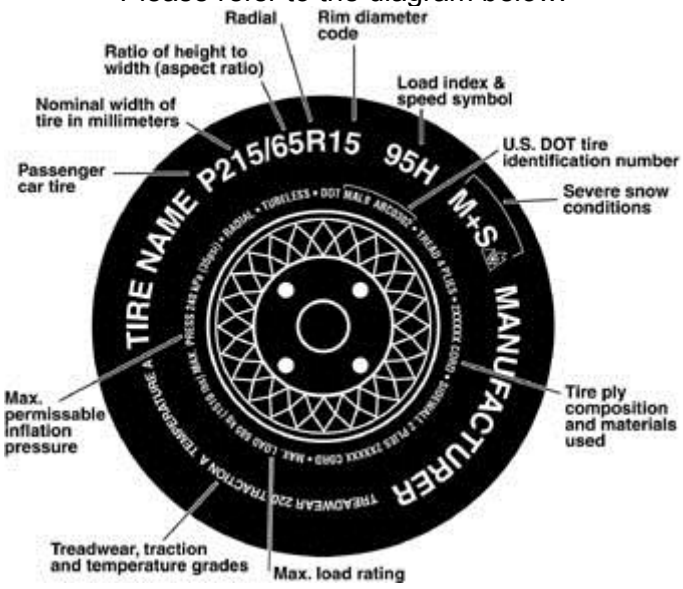
The proper repair of a punctured tire requires a plug for the hole and a patch for the area inside the tire that surrounds the puncture hole. Punctures through the tread can be repaired if they are not too large, but punctures to the sidewall should not be repaired. Tires must be removed from the rim to be properly inspected before being plugged and patched.

3.4.10 TIRE FUNDAMENTALS

Federal law requires tire manufacturers to place standardized information on the sidewall of all tires. This information identifies and describes the fundamental characteristics of the tire and also provides a tire identification number for safety standard certification and in case of a recall.

3.4.10.1 INFORMATION ON PASSENGER VEHICLE TIRES

Please refer to the diagram below.



P
The "P" indicates the tire is for passenger vehicles.

Next number
This three-digit number gives the width in millimeters of the tire from sidewall edge to sidewall edge. In general, the larger the number, the wider the tire.

Next number
This two-digit number, known as the aspect ratio, gives the tire's ratio of height to width. Numbers of 70 or lower indicate a short sidewall for improved steering response and better overall handling on dry pavement.

R
The "R" stands for radial. Radial ply construction of tires has been the industry standard for the past 20 years.

Next number
This two-digit number is the wheel or rim diameter in inches. If you change your wheel size, you will have to purchase new tires to match the new wheel diameter.

Next number
This two- or three-digit number is the tire's load index. It is a measurement of how much weight each tire can support. You may find this information in your owner's manual. If not, contact a local tire dealer. Note: You may not find this information on all tires because it is not required by law.

M+S
The "M+S" or "M/S" indicates that the tire has some mud and snow capability. Most radial tires have these markings; hence, they have some mud and snow capability.

Speed Rating
The speed rating denotes the speed at which a tire is designed to be driven for extended periods of time. The ratings range from 99 miles per hour (mph) to 186 mph. These ratings are listed below. Note: You may not find this information on all tires because it is not required by law.

Letter Rating	Speed Rating
Q	99 mph
R	106 mph
S	112 mph
T	118 mph
U	124 mph
H	130 mph
V	149 mph
W	168* mph
Y	186* mph

* For tires with a maximum speed capability over 149 mph, tire manufacturers sometimes use the letters ZR. For those with a maximum speed capability over 186 mph, tire manufacturers always use the letters ZR.

U.S. DOT Tire Identification Number
This begins with the letters "DOT" and indicates that the tire meets all federal standards. The next two numbers or letters are the plant code where it was manufactured, and the last four numbers represent the week and year the tire was built. For example, the numbers 3197 means the 31st week of 1997. The other numbers are marketing codes used at the manufacturer's discretion. This information is used to contact consumers if a tire defect requires a recall.

Tire Ply Composition and Materials Used
The number of plies indicates the number of layers of rubber-coated fabric in the tire. In general, the greater the number of plies, the more weight a tire can support. Tire manufacturers also must indicate the materials in the tire, which include steel, nylon, polyester, and others.

Maximum Load Rating
This number indicates the maximum load in kilograms and pounds that can be carried by the tire.

Maximum Permissible Inflation Pressure
This number is the greatest amount of air pressure that should ever be put in the tire under normal driving conditions.

3.4.10.2 UTQGS Information

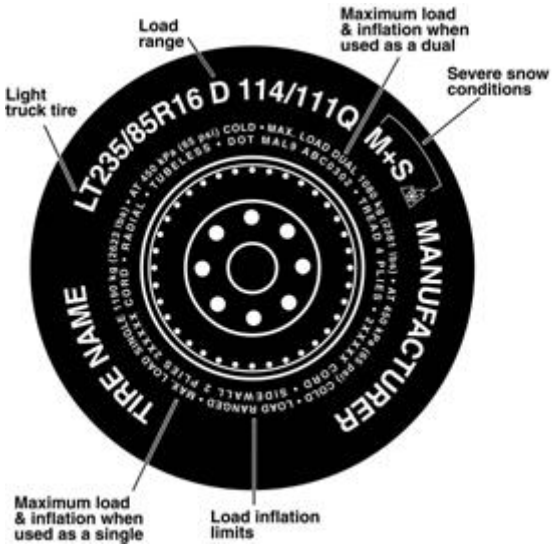
Treadwear Number
This number indicates the tire's wear rate. The higher the treadwear number is, the longer it should take for the tread to wear down. For example, a tire graded 400 should last twice as long as a tire graded 200.

Traction Letter
This letter indicates a tire's ability to stop on wet pavement. A higher graded tire should allow you to stop your car on wet roads in a shorter distance than a tire with a lower grade. Traction is graded from highest to lowest as "AA","A", "B", and "C".

Temperature Letter
This letter indicates a tire's resistance to heat. The temperature grade is for a tire that is inflated properly and not overloaded. Excessive speed, underinflation or excessive loading, either separately or in combination, can cause heat build-up and possible tire failure. From highest to lowest, a tire's resistance to heat is graded as "A", "B", or "C".

3.4.10.3 ADDITIONAL INFORMATION ON LIGHT TRUCK TIRES

Please refer to the following diagram.



Tires for light trucks have other markings besides those found on the sidewalls of passenger tires.

LT
The "LT" indicates the tire is for light trucks or trailers.

ST
An "ST" is an indication the tire is for trailer use only.

Max. Load Dual kg (lbs) at kPa (psi) Cold
This information indicates the maximum load and tire pressure when the tire is used as a dual, that is, when four tires are put on each rear axle (a total of six or more tires on the vehicle).

Max. Load Single kg (lbs) at kPa (psi) Cold
This information indicates the maximum load and tire pressure when the tire is used as a single.

Load Range
This information identifies the tire's load-carrying capabilities and its inflation limits.

3.4.11 TIRE SAFETY TIPS

Preventing Tire Damage

- Slow down if you have to go over a pothole or other object in the road.
- Do not run over curbs or other foreign objects in the roadway, and try not to strike the curb when parking.

Tire Safety Checklist

- Check tire pressure regularly (at least once a month), including the spare.
- Inspect tires for uneven wear patterns on the tread, cracks, foreign objects, or other signs of wear or trauma.
- Remove bits of glass and foreign objects wedged in the tread.
- Make sure your tire valves have valve caps.
- Check tire pressure before going on a long trip.
- Do not overload your vehicle. Check the Tire Information and Loading Placard or User's Manual for the maximum recommended load for the vehicle.

4 COUPLING TO THE TOW VEHICLE

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4.2.6 Uncoupling The Trailer 9

Follow all of the safety precautions and instructions in this manual to ensure safety of persons, cargo, and satisfactory life of the trailer.

4.1 Use an Adequate Tow Vehicle and Hitch

If the vehicle or hitch is not properly selected and matched to the Gross Vehicle Weight Rating (GVWR) of your trailer, you can cause an accident that could lead to death or serious injury. If you already have a tow vehicle, know your vehicle tow rating, and Gross Combination Weight Rating (GCWR) and make certain the trailer's rated capacity is less than or equal to the tow vehicle's rated towing capacity. Make certain that the tow rating of the tow vehicle is equal to or greater than the GVWR of the trailer, and that the GCWR will be within limits.

^ DANGER

Use of a hitch with a load rating less than the load rating of the trailer can result in loss of control and may lead to death or serious injury.

Use of a tow vehicle with a towing capacity less than the load rating of the trailer can result in loss of control, and may lead to death or serious injury.

Be sure your hitch and tow vehicle are rated for the Gross Vehicle Weight Rating of your trailer.

4.1.1 Trailer Information

The location of the trailer Certification / VIN tag is shown.

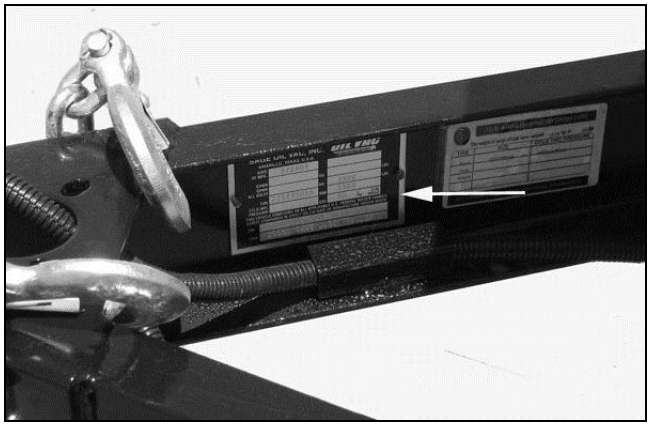

Figure 1 - VIN Tag

The trailer Certification / VIN tag contains the following critical safety information for the use of your trailer:

- **MFD BY:** Sage Oil Vac, Inc.
- **DATE OF MANUFACTURE:** Month and year the trailer was manufactured.
- **GAWR:** The Gross Axle Weight Rating is the maximum gross weight that an axle can support. It is the lowest of axle, wheel, or tire rating. Sometimes the tire or wheel rating is lower than the axle manufacturers rating, and will then determine GAWR.
- **TIRE SIZE:** The tire size recommended for your trailer and load range.
- **RIM SIZE:** The rim size recommended for your trailer.
- **Cold Inflation Pressure:** The pounds per square inch is the tire pressure measured when tires are cold.

- **CERTIFICATION STATEMENT**: "This trailer meets all the Federal Motor Vehicle Safety Standards in effect on the date of manufacture shown above".
- **VIN:** The Vehicle Identification Number.
- **TYPE**: Trailer Model

4.1.2 TOW VEHICLE INFORMATION

- **Tow Vehicle:** When equipping a new vehicle or an older vehicle to tow your trailer, ask the vehicle dealer for advice on how to outfit the towing vehicle. Discuss the following information and equipment with the vehicle dealer.

- **Overall Carrying and Towing Capacity of Vehicle:** Vehicle manufacturers will provide you with the maximum towing capacities of their various models, as well as the GCWR. No amount of reinforcement will give a 100 horsepower, 2,500 pound truck the towing capacity that a 300 horsepower, 5,000 pound truck has.

- **Towing Hitch**: The towing hitch attached to your tow vehicle must have a capacity equal to or greater than the load rating of the trailer you intend to tow. The hitch capacity must also be matched to the tow vehicle capacity.

- **Emergency Flares and Emergency Triangle Reflectors:** It is wise to carry these warning devices even if you are not towing a trailer. It is particularly important to have these when towing a trailer because the hazard flashers of your towing vehicle will not operate for as long a period of time when the battery is running both the trailer lights and tow vehicle lights.

4.2 COUPLING AND UNCOUPLING THE TRAILER

A secure coupling of the trailer to the tow vehicle is essential. A loss of coupling may result in death or serious injury. Therefore, you must understand and follow all of the instructions for coupling.

The following parts are involved in making a secure coupling between the trailer and tow vehicle:

Coupling: The part of the trailer connecting mechanism by which the connection is actually made to the trailer hitch. This does not include any structural member, extension of the trailer frame, or brake controller.

Hitch: That part of the connecting mechanism including the ball support platform and ball and those components that extend and are attached to the towing vehicle, including bumpers intended to serve as hitches.)

Safety chains: Chains permanently attached to the trailer such that if the coupler connection comes loose, the safety chains can keep the trailer attached to the tow vehicle. With properly rigged safety chains, it is possible to keep the tongue of the trailer from digging into the road pavement, even if the coupler-to-hitch connection comes apart.

Trailer lighting connector: A device that connects electrical power from the tow vehicle to the trailer. Electricity is used to turn on brake lights, running lights, and turn signals as required. The electrical connector will also supply power to the trailer brakes from the tow vehicle.

^ WARNING

An improperly coupled trailer can result in death or serious injury.

Do not move the trailer until:

- **The coupler is secured and locked to hitch;**
- **The safety chains are secured to the tow vehicle; and**
- **The trailer jack is fully retracted.**

Do not tow the trailer on the road until:

- **Tires and wheels are checked;**
- **Items on trailer are secured; and**
- **The trailer lights are connected and checked.**

4.2.1 COUPLERS

Sage Oil Vac trailers are produced with a ball coupler or a pintle ring.

If the coupler on your trailer does not resemble one of the couplers shown in the figures and you need assistance, contact Sage Oil Vac or your dealer.

4.2.2 TRAILER WITH BALL COUPLER

A ball coupler connects to a ball that is located on or under the rear bumper of tow vehicle.

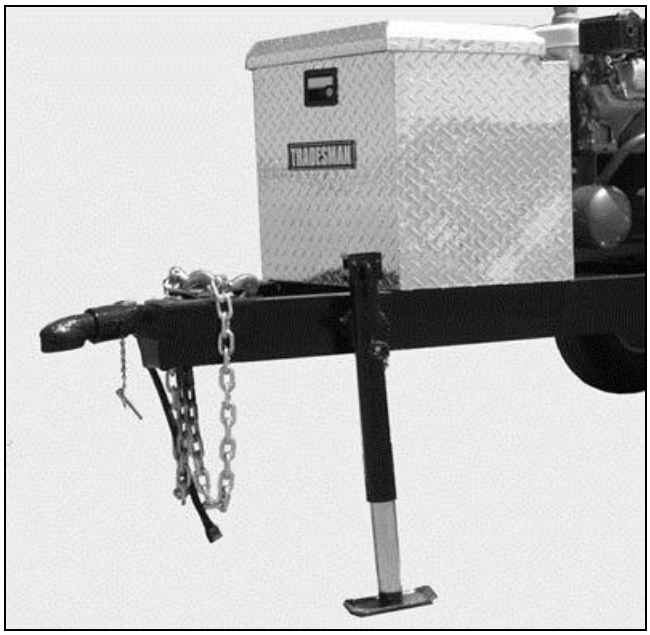

Figure 2 - Trailer Tongue and Ball Coupler

The load rating of the coupler and the necessary ball size are listed on the trailer tongue. You must provide a hitch and ball for your tow vehicle, where the load rating of the hitch and ball is equal to or greater than that of your trailer. Also, the ball size must be the same as the coupler size. If the hitch ball is too small, too large, is underrated, is loose or is worn, the trailer can come loose from the tow vehicle, and may cause death or serious injury.

THE TOW VEHICLE, HITCH AND BALL MUST HAVE A RATED TOWING CAPACITY EQUAL TO OR GREATER THAN THE TRAILER GROSS VEHICLE WEIGHT RATING (GVWR).

IT IS ESSENTIAL THAT THE HITCH BALL BE OF THE SAME SIZE AS THE COUPLER.

The ball size and load rating (capacity) are marked on the ball; hitch capacity is marked on the hitch.

4.2.2.1 Before Coupling The Trailer To The Tow Vehicle

Be sure the size and rating of hitch ball match the size and rating of the coupler. Hitch balls and couplers are marked with their size and rating.

^ WARNING

Coupler-to-hitch mismatch can result in uncoupling, leading to death or serious injury.

Be sure the LOAD RATING of the hitch ball is equal or greater than the load rating of the coupler.

Be sure the SIZE of the hitch ball matches the size of the coupler.

- Wipe the hitch ball clean and inspect it visually and by feel for flat spots, cracks and pits.

^ WARNING

A worn, cracked or corroded hitch ball can fail while towing, and may result in death or serious injury.

Before coupling trailer, inspect the hitch ball for wear, corrosion and cracks.

Replace worn or damaged hitch ball.

- Rock the ball to make sure it is tight to the hitch and visually check that the hitch ball nut is solid against the lock washer and hitch frame.
- Wipe the inside and outside of the coupler clean and inspect it visually for cracks and deformations; feel the inside of the coupler for worn spots and pits.
- Be sure the coupler is tight to the tongue of the trailer. All coupler fasteners must be visibly solid against the trailer frame.

^ WARNING

A loose hitch-ball nut can result in uncoupling, leading to death or serious injury.

Be sure the hitch ball is tight to the hitch before coupling the trailer.

- Extend the jack to raise the bottom surface of the coupler to be above the top of the hitch ball.

4.2.2.2 Prepare The Coupler And Hitch

- Lubricate the hitch ball and the inside of the coupler with a thin layer of automotive bearing grease.

- Open the coupler locking mechanism.
- In the open position, the coupler is able to drop fully onto the hitch ball.
- Slowly back up the tow vehicle so that the hitch ball is near or aligned under the coupler, if the trailer jack has raised the coupler.

4.2.2.3 COUPLE THE TRAILER TO THE TOW VEHICLE

- Turn the jack handle to lower the trailer tongue until the coupler fully engages the hitch ball. If the coupler does not line up with the hitch ball, adjust the position of the tow vehicle.
- Engage the coupler locking mechanism. In the engaged position, the locking mechanism securely holds the coupler to the hitch ball.
- Insert a pin or lock through the hole in the locking mechanism.
- Be sure the coupler is all the way on the hitch ball and the locking mechanism is engaged. A properly engaged locking mechanism will allow the coupler to raise the rear of the tow vehicle. Using the trailer jack, test to see that you can raise the rear of the tow vehicle by 1 inch, after the coupler is locked to the hitch.

NOTICE
Overloading can damage the tongue jack. Do not use the tongue jack to raise the tow vehicle more than 1 inch.

If the coupler cannot be secured to the hitch ball, do not tow the trailer. Call Sage Oil Vac or dealer for assistance.

- Lower the trailer so that its entire tongue weight is held by the hitch, and continue retracting the jack to its fully retracted position. Pull pin and rotate jack to the horizontal position and install pin.
- **Go to "Connect Safety Chains" to continue connection trailer to tow vehicle.**

4.2.3 TRAILER WITH PINTLE RING

A ring connects to the pintle that is located on or under the rear bumper of tow vehicle.

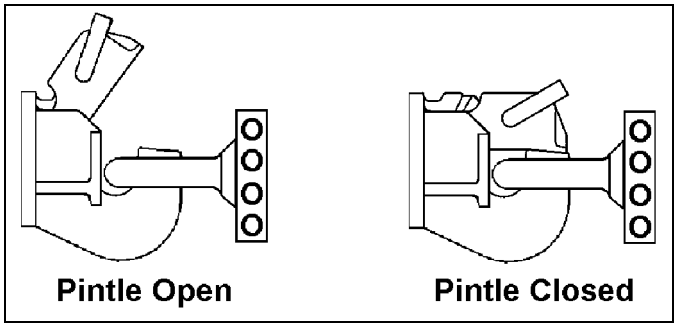

Figure 3 - Trailer with Pintle Ring

The load rating of the ring and the necessary pintle size are listed on the trailer tongue. You must provide a pintle for your tow vehicle, where the load rating of the hitch and pintle is equal to or greater than that of your trailer. Also, the pintle size must be the same as the ring size. If the pintle is too small, too large, is underrated, is loose or is worn, the trailer can come loose from the tow vehicle, and may cause death or serious injury.

THE TOW VEHICLE, HITCH AND PINTLE MUST HAVE A RATED TOWING CAPACITY EQUAL TO OR GREATER THAN THE TRAILER Gross Vehicle Weight Rating (GVWR).

IT IS ESSENTIAL THAT THE PINTLE BE OF THE SAME SIZE AS THE RING.

The pintle size and load rating (capacity) are marked on the pintle; ring capacity is marked on the ring.

4.2.3.1 Before Coupling The Trailer To The Tow Vehicle

Be sure the size and rating of pintle match the size and rating of the ring. Hitch ring and pintles are marked with their size and rating.

^ WARNING

Coupler-to-hitch mismatch can result in uncoupling, leading to death or serious injury.

Be sure the LOAD RATING of the pintle is equal or greater than the load rating of the coupler.

Be sure the SIZE of the pintle matches the size of the ring.

- Wipe the pintle clean and inspect it visually and by feel for flat spots, cracks and pits.

^ WARNING

A worn, cracked or corroded pintle can fail while towing, and may result in death or serious injury.

Before coupling trailer, inspect the pintle for wear, corrosion and cracks.

Replace worn or damaged pintle.

- Rock the pintle to make sure it is tight to the hitch and visually check that the pintle fasteners are solid against the hitch frame.
- Wipe the inside and outside of the ring clean and inspect it visually for cracks and deformations; feel the inside of the ring for worn spots and pits.
- Be sure the ring is tight to the tongue of the trailer. All ring fasteners must be visibly solid against the trailer frame.

^ WARNING

A loose pintle can result in uncoupling, leading to death or serious injury.

Be sure the pintle is tight to the hitch before coupling the trailer.

- Raise the bottom surface of the ring to be above the top of the open pintle.

4.2.3.2 Prepare The Ring and Pintle

- Lubricate the inside of the pintle with a thin layer of automotive bearing grease.
- Remove the safety latch pin and open the pintle locking mechanism. In the open position, the ring is able to drop fully onto the pintle.
- See the coupler instructions for details of placing the pintle in the “open” position.
- Slowly back up the tow vehicle so that the pintle is near or aligned under the ring.

4.2.3.3 Couple The Trailer To The Tow Vehicle

- Lower the trailer tongue until the ring fully engages the pintle. If the ring does not line up with the pintle, adjust the position of the tow vehicle.

- Engage the pintle locking mechanism. In the engaged position, the locking mechanism securely holds the ring to the pintle.
- Insert the safety lock pin through the hole in the locking mechanism.
- Be sure the ring is all the way on the pintle and the locking mechanism is engaged. A properly engaged locking mechanism will allow the ring to raise the rear of the tow vehicle. Using the trailer jack, test to see that you can raise the rear of the tow vehicle by 1 inch, after the coupler is locked to the hitch.

NOTICE

Overloading can damage the tongue jack. Do not use the tongue jack to raise the tow vehicle more than 1 inch.

If the ring cannot be secured to the pintle, do not tow the trailer. Call Sage Oil Vac or your dealer for assistance.

- Lower the trailer so that its entire tongue weight is held by the hitch, and continue retracting the jack to its fully retracted position.
- **Go to "Connect Safety Chains" to continue connecting trailer to tow vehicle.**

4.2.4 CONNECT SAFETY CHAINS

Visually inspect the safety chains and hooks for wear or damage. Replace worn or damaged safety chains and hooks before towing.

Rig the safety chains so that they:

- Cris-cross underneath the coupler so if the trailer uncouples, the safety chains can hold the tongue up above the road.
- Loop around a frame member of the tow vehicle or to holes provided in the hitch system (but, do **not** attach them to an interchangeable part of the hitch assembly).
- Attach hooks up from underneath the hole (do not just drop into hole); and
- Provide enough slack to permit tight turns, but not be close to the road surface to drag.

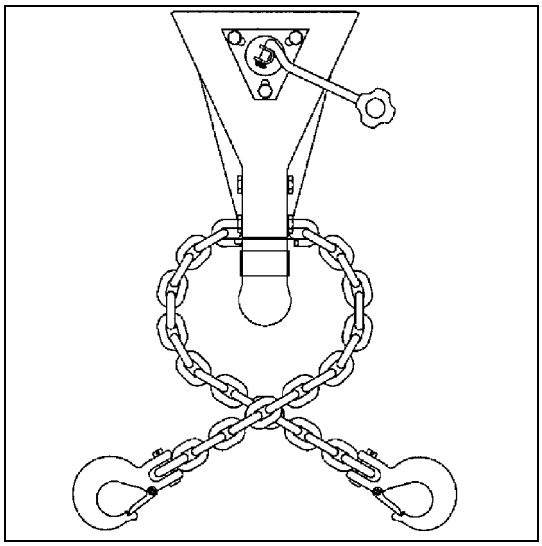

Figure 4 - Connect Safety Chains

^ WARNING

Improper rigging of the safety chains can result in loss of control of the trailer and tow vehicle, leading to death or serious injury, if the trailer uncouples from the tow vehicle.

- **Fasten chains to frame of tow vehicle. Do not fasten chains to any part of the hitch unless the hitch has holes or loops specifically for that purpose.**
- **Cross chains underneath hitch and coupler with enough slack to permit turning and to hold tongue up, if the trailer comes loose.**

4.2.5 CONNECT THE ELECTRICAL CABLE

- Connect the trailer electrical connector to the tow vehicle's electrical connector.
- Check all lights for proper operation.

^ WARNING

Improper electrical connection between the tow vehicle and the trailer will result in inoperable lights and can lead to collision.

Before each tow, check that the taillights, brake lights and turn signals work.

4.2.6 UNCOUPLING THE TRAILER

Follow these steps to uncouple your trailer from the tow vehicle:

- Park the trailer on a firm level surface.
- Block trailer tires to prevent the trailer from rolling.
- Disconnect the electrical connector.
- Disconnect the safety chains from the tow vehicle.
- Unlock the coupler and open it.
- Before extending jack, make certain the ground surface below the jack pad will support the tongue load.
- Pivot jack to the vertical position. Rotate the jack handle to extend the jack and transfer the weight of the trailer tongue to the jack.
- Raise the coupler or ring above the tow vehicle hitch.

5 TOWING

5 Towing 1
5.1 Pre-tow Checklist 2
5.2 Make Regular Stops 2
5.3 Retighten Lug Nuts at First 10, 25 & 50 Miles 2
5.4 Tire Pressure 2

Follow all of the safety precautions and instructions in this manual to ensure safety of persons, cargo, and satisfactory life of the trailer.

5.1 Pre-tow Checklist

Before towing, double-check all of these items. See the Maintenance Section for more information.

- Check the tires, wheels and lug nuts.
- Check tire Pressure. Inflate tires on trailer and tow vehicle to the pressure stated on the VIN / Certification label.
- Coupler secured and locked. See Section 4 of this manual.
- Safety chains properly rigged to tow vehicle, not to hitch or ball. See Section 4 of this manual.
- Test all lights for operation.
- Items on trailer properly secured.
- Fire extinguisher.
- Flares and reflectors.

5.2 Make Regular Stops

After each 50 miles, or one hour of towing, stop and check the following items:

- Coupler secured.
- Safety chains are fastened and not dragging.
- Cargo secured.

5.3 Retighten Lug Nuts at First 10, 25 & 50 Miles

Wheel lugs can shift and settle quickly after being first assembled, and must be checked after the **first** 10, 25 and 50 miles of driving. Failure to perform this check may result in a wheel coming loose from the trailer, causing a crash leading to death or serious injury.

^ WARNING

Lug nuts are prone to loosen after initial installation, which can lead to death or serious injury.

Check lug nuts for tightness on a new trailer or when wheel(s) have been remounted after the first 10, 25 and 50 miles of driving.

5.4 Tire Pressure

Check tire pressures on both the trailer and tow vehicle. Inflate to the maximum shown on the VIN / Certification Label.

6 Operation & Basic Fluid Change 1
6.1 Prepare System For Use 2
6.1.1 Visual Equipment Inspection 2
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6.9 Gallons Per Minute 21

Follow all of the safety precautions and instructions in this manual to ensure safety of persons, cargo, and satisfactory life of the trailer and equipment.

6.1 Prepare System For Use

^ WARNING

Risk of fire or explosion.

Do not smoke or use an open flame within 50 feet of the unit.

Verify that correct grounding procedures have been followed prior to operation.

If fluid is spilled, stop operation and notify safety personnel.

^ WARNING

Burn hazard.

Hoses and fittings may be hot during operation.

Contact with these parts may cause serious burns.

^ WARNING

Risk of hearing loss.

This machine produces extremely loud noise.

Hearing protection is required while operating this machine.

6.1.1 Visual Equipment Inspection

Follow the steps below to prepare the Sage Oil Vac for use. Failure to follow these steps may prevent operation of the system or create a safety hazard.

- Couple trailer to tow vehicle and perform trailer pre-trip inspections (see Section 4).
- Inspect all hose pulls, nozzles, fittings, tanks and related parts for damage, cracking and signs of leakage and missing parts. Hoses on reels can be inspected as they are pulled up the tower.
- Inspect air compressor and engine for damage, leaks and missing parts.
- Check flush hose filter indicator. If indicator is red, the filter must be changed.
- Place all valves in the closed position.
- Check all fluid tank level gauges for the presence of fluids. If the used fluid tank is above the 90% level, proceed to used product disposal location after completing the visual equipment inspection.
- Verify that the vacuum/pressure gauges read zero.
- Check the compressor engine fuel level. If the fuel level is low, refuel using the appropriate fuel type. See engine owners manual for fuel specification.
- Check the compressor oil level. If the compressor oil level is low, add oil. See compressor owners manual for oil specification.
- Secure the toolbox latch or lid.
- Check the light switches for ease of operation and ensure that they are in the off position.

- Verify the work light holding bolts are tight and do not allow the work lights to move around during transport.
- Verify the hoses are coiled on reels and their dust covers are installed and secure.
- Drain moisture from the compressor tanks and ensure the drain valves are closed.
- Verify the new fluid fill cam-lock cap and the used fluid disposal cam-lock cap are secure.

6.2 Air Compressor And Pump Engine Operation

Before operating the compressor and pump, you must read and fully understand the manufacturer's instructions. If you do not have the manufacturers' instructions, contact Sage Oil Vac or your dealer for assistance.

This manual provides you with basic start up and shut down procedures for the recoil start gasoline engine. Refer to the Owner's Manual provided with engine for additional safety, operation and maintenance information.

The exhaust from the engine contains carbon monoxide. Carbon monoxide is an odorless gas that can cause death. Avoid any actions or areas that expose you to carbon monoxide. Do not operate the engine in an enclosed building or confined area. Open all doors on enclosed trailers before starting engine.

^ WARNING

Operating an engine can lead to death or serious injury by:

- **Carbon Monoxide**
- **Fire and Explosion**

Avoid any actions or areas that expose you to carbon monoxide.

Open all doors on enclosed trailers.

Do not refuel a running engine or refuel near ignition sources.

^ WARNING

The exhaust from this engine contains chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.

^ WARNING

Risk from moving parts.

Never operate the pump or compressor with guards or shields removed.

Never touch moving parts.

6.2.1 Starting Engine

Note: For oil check locations and for oil and fuel requirements, see the engine owner's manuals provided with your Sage Oil Vac. If you do not have these manuals, contact Sage Oil Vac or your dealer for assistance.

1. Check the engine oil level.

2. Check the compressor or pump crankcase oil level.

3. Check the drive belt tension. Adjust tension if necessary.

4. Move the fuel valve lever (1) to the ON position. See figure 1.

5. To start a cold engine, move the choke lever (2) to the CLOSED position. To start a warm engine, leave the choke lever (1) in the OPEN position. See figure 1.

6. Move the throttle lever (3) away from the MIN position about 1/3 of the way toward the MAX position. See figure 1.

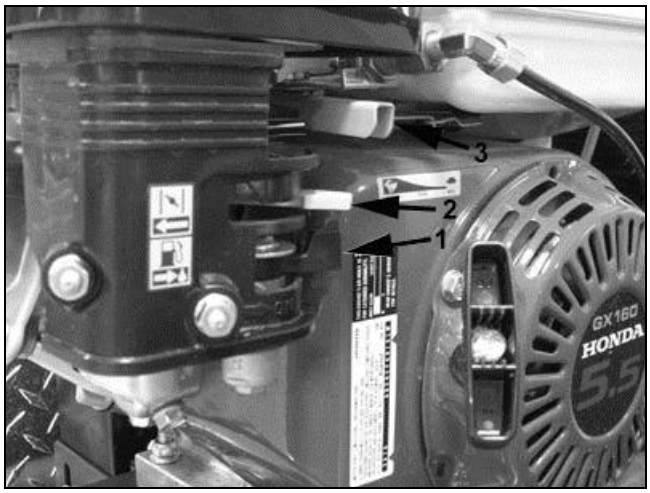


Figure 1 - Fuel Shutoff

7. Turn the engine switch (4) to the ON position. See figure 2.

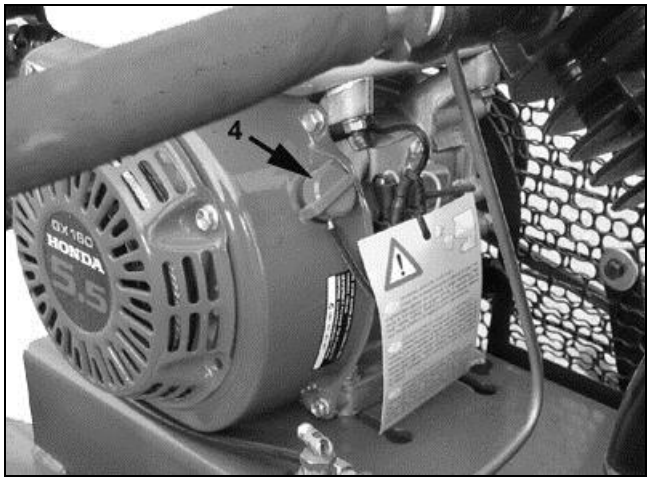


Figure 2 - Engine Switch

8. Pull the recoil starter grip lightly until you feel resistance, then pull briskly to start engine. Allow the starter grip to return gently to the engine, do not allow grip to snap back. After engine starts, adjust throttle as necessary.

6.2.2 STOPPING THE ENGINE

1. Move the throttle lever to the MIN Position.

2. Move the engine switch to the OFF position.

3. Move the fuel valve lever to the OFF position.

6.3 Fill New Product Tank Or Flush Oil Tank

Note: It is recommended to perform step 6.3 the evening prior to performing the actual gearbox oil changes to maximize fresh fluid temperature and fresh fluid filtering requirements. For exact specifications on which type of fluid should be used consult the equipment service manuals.

The new product and flush oil tank can be filled by pouring fluid directly into the fluid intake nozzle or by siphoning from a drum or barrel with vacuum. The following steps describe the vacuum method.

6.3.1 Create Vacuum In New Product Tank

1. Check that the vacuum/pressure gauge (1) reads zero, indicating no pressure or vacuum in the tank. See figure 3. If there is pressure in the tank to be filled, relieve pressure by disconnecting the air hose (if necessary) and opening the ball valve (2) at the air intake. After pressure is relieved, close the air intake ball valve.

^ WARNING

Pressure hazard.

Failure to relieve pressure may result in serious injury.

Relieve pressure before filling product tanks.

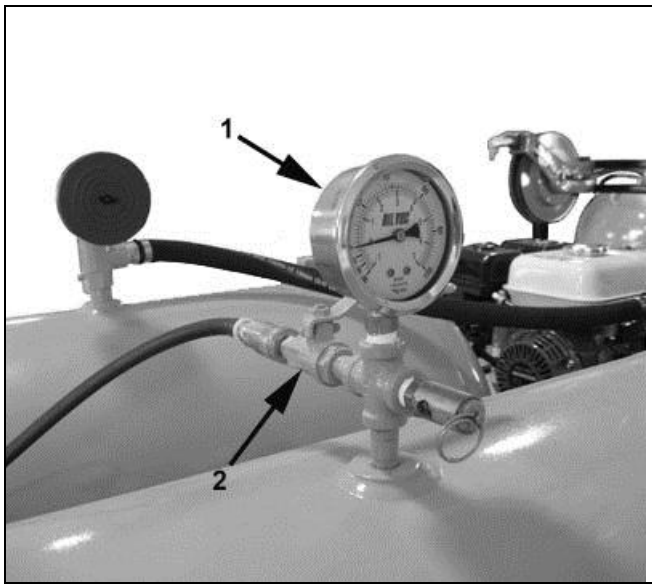
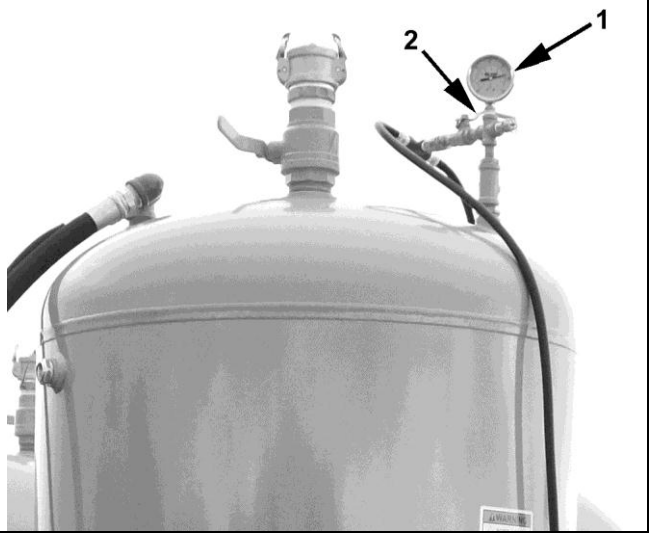


Figure 3 - New Product Tank Gauge



Flush Oil Tank Gauge

2. Attach the jumper hose from used oil tank to the quick connect vacuum fitting (3). See figure 4.

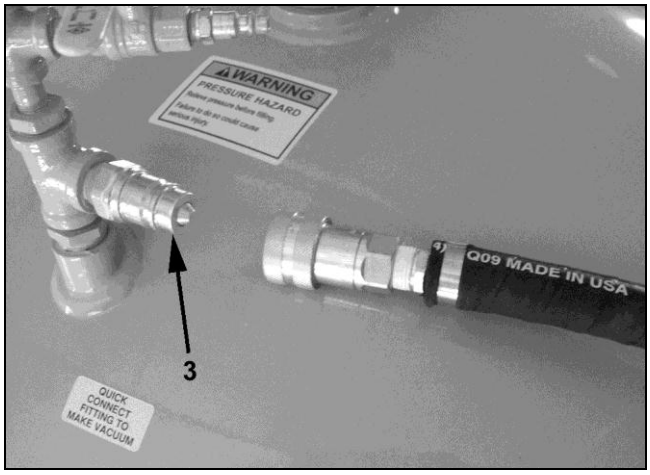


Figure 4 - Quick Disconnect Fitting To Make Vacuum

3. Open the air compressor tank drain valves (4). See figure 5.

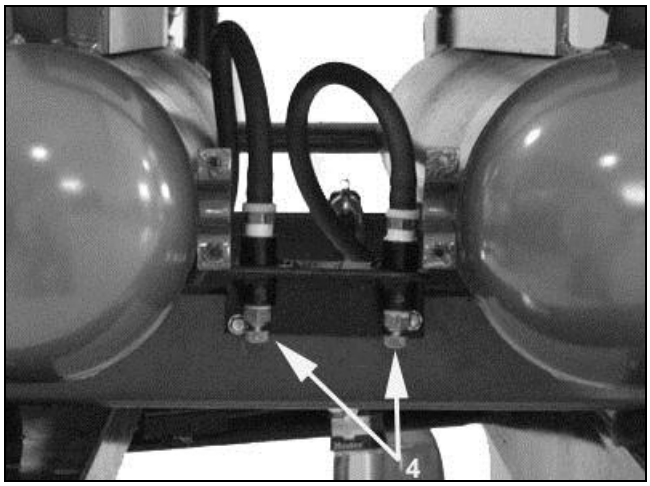


Figure 5 - Compressor Drain Valves

4. Start the compressor. *See section 6.2 or the separate compressor operation instructions.*

5. Place the appropriate 3-way valve (5) in the vacuum position as shown in figure 6.

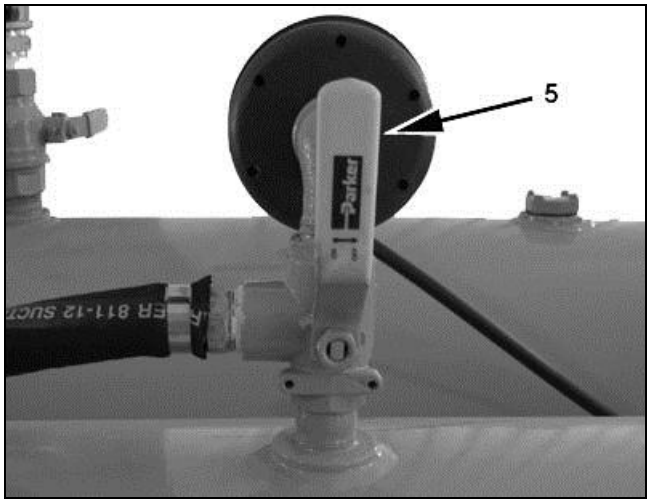


Figure 6 - 3-Way Valve In Vacuum Position

6. Observe the vacuum/pressure gauge until approximately –20 inches (Hg-Mercury) of vacuum is reached.

Note: There is no risk of damage to equipment if operator allows compressor to run for extended periods building vacuum. Once the maximum amount of vacuum is achieved the compressor will simply run until stopped by the operator.

7. Place the 3-way valve (5) in the normal air compressor position. See figure 7.

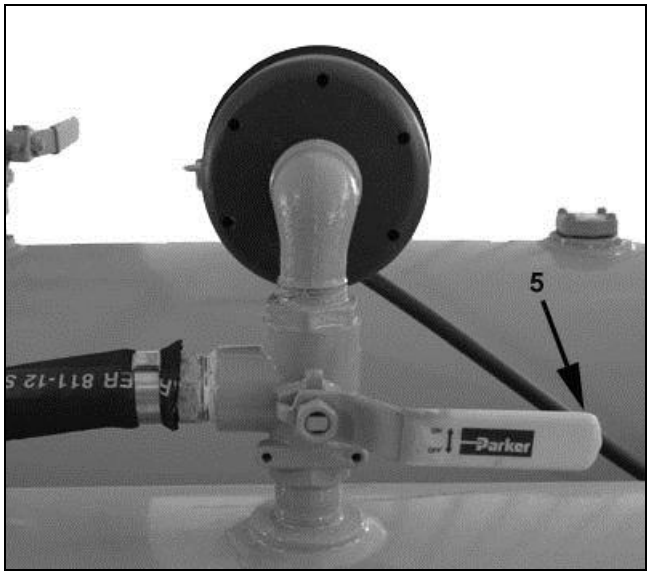


Figure 7 - 3-Way Valve In Air Compressor Position

8. Stop the compressor engine.

9. The Sage Oil Vac system is now prepared to fill the new fluid tank using the vacuum method.

6.3.2 Fill New Product Or Flush Oil Tank From A Drum

1. Stand drum on end with plugs up.

2. Remove the 2” plug and insert cam-lock adapter (1) into drum. Tighten adapter.

3. Remove small plug and install breather (2). Tighten breather.

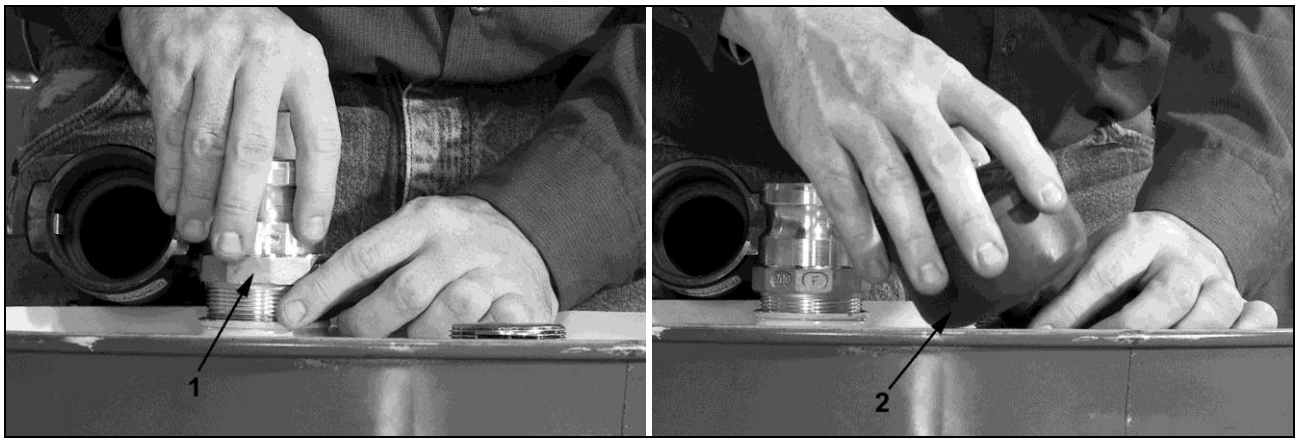


Figure 8 – Barrel Fittings

4. Connect hose from new product tank or flush tank to cam-lock connector.

^ WARNING

Crushing hazard.

Full barrel weight is approximately 380 lbs.

Use a safe procedure to lay barrel on its side.

5. Using a safe procedure, lay drum over on its side with the breather at the top and cam-lock coupler at the bottom. Turn suction hose to prevent damage to hose and coupler.

6. Open the appropriate fill nozzle ball valve.

7. Monitor the product level in the drum and on the appropriate tank level gauge and vacuum level.

Note: If there is insufficient vacuum to fill the tank, you will have to follow the steps to create a vacuum to fill the tank to desired level.

Note: Additional vacuum may be supplied by leaving the jumper hose attached to the new product tank. Care should be taken to ensure the new product tank is not filled beyond the 90% recommended capacity. Overfilling the new product tank could result in new fluid entering the used product tank.

8. Close the appropriate tank fill nozzle valve when tank is a maximum of 90% full.

9. Close the used product hose valve.

10. Stand drum up and remove hose, cam-lock coupler and breather. Replace drum plugs.

6.3.3 Fill New Product Or Flush Oil Tank Using Barrel Straw

1. Retrieve the barrel straw. See Figure 9.

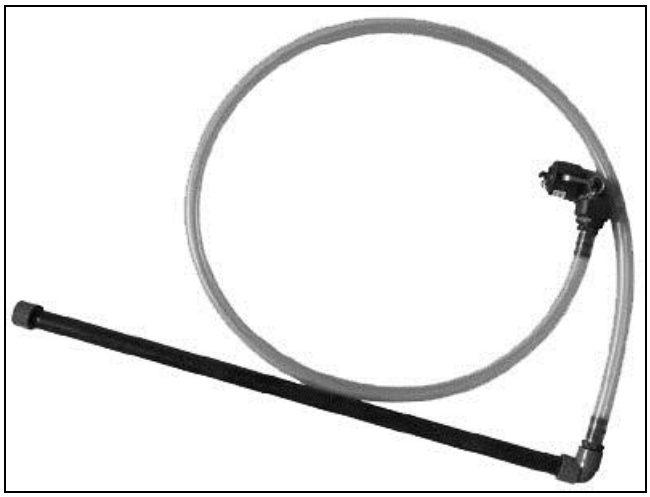


Figure 9 – Barrel Straw

2. Verify that the appropriate tank fill nozzle valve (1) is closed as shown in figure 10.

3. Remove the cam-lock cap (2) from the appropriate tank fill nozzle. See figure 10.

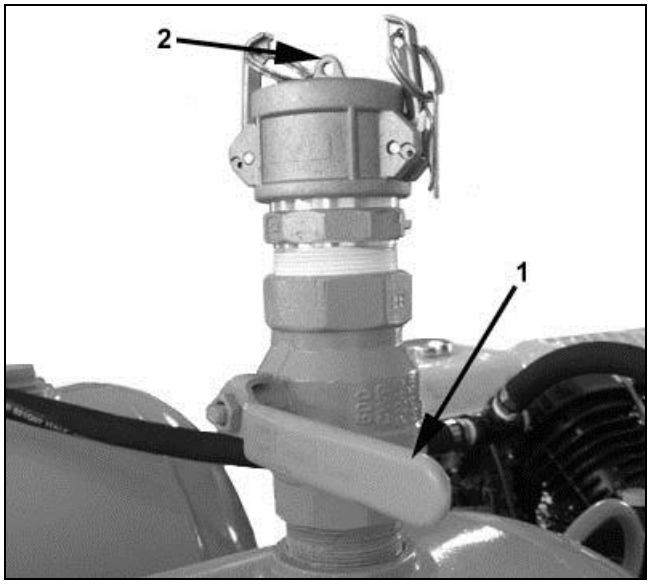


Figure 10 – Fill Valve and Cam-Lock Cap

4. Attach the barrel straw to the appropriate tank fill nozzle. Secure the connection using the cam lock levers on the connector.

5. Verify the appropriate container is the proper fluid for the fluid tank you are filling.

6. Insert the barrel straw into the new product container.

7. Open the appropriate fill nozzle ball valve. See Figure 11 (valve shown in the closed position).

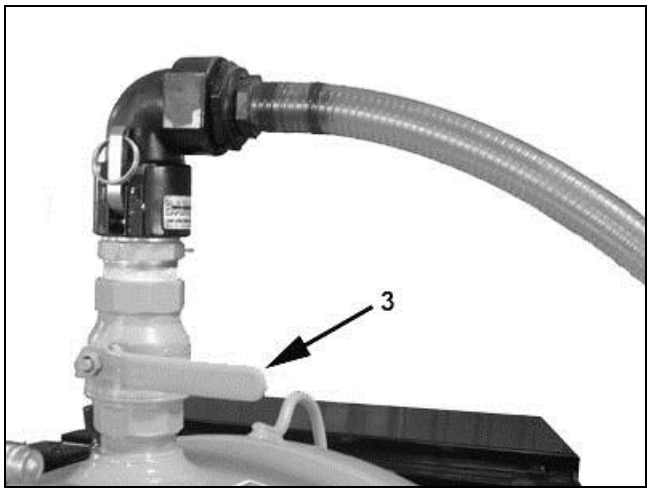


Figure 11 – New Product Fill Valve

8. Monitor the product barrel or drum level and the appropriate tank level gauge and vacuum. Flow through the barrel straw is 10-20 gpm depending on viscosity.

Note: If there is insufficient vacuum to fill the tank, you will have to follow the steps to create a vacuum to fill the tank to desired level.

Note: Additional vacuum may be supplied by leaving the jumper hose attached to the new product tank. Care should be taken to ensure the new product tank is not filled beyond the 90% recommended capacity. Overfilling the new product tank could result in new fluid entering the used product tank.

9. Close the appropriate tank fill nozzle valve when tank is a maximum of 90% full.

10. Close the used product hose valve.

11. Carefully remove the barrel straw from the new product container. Invert and elevate the barrel straw and open new product tank fill nozzle valve for a few seconds to clear the tool or until vacuum is gone from fresh fluid tank.

^ CAUTION

Risk of fluid spillage.

There may be traces of fluid in the barrel straw that can spill out during removal.

12. Remove and stow the barrel straw.

13. Replace the appropriate tank fill nozzle cam lock cap.

14. Remove and stow the used product hose.

15. Re-establish vacuum in the used product tank by restarting the compressor and moving the 3-way valve to the vacuum position. This prepares the used product tank for operation.

It is recommended that filtration system and heat system be allowed to run 6-8 hours minimum to allow multiple passes through heater and filtration. The filtration system and heat system can run all night if started at 6 pm or later. It is important that the filtration and heat run a minimum of 6-8 hours.

6.4 Filter And Heat Fresh Gear Oil

1. Locate the power cord connected to the filtration system and connect cord to a 120 volt power source. Move power switch (1) to on position.

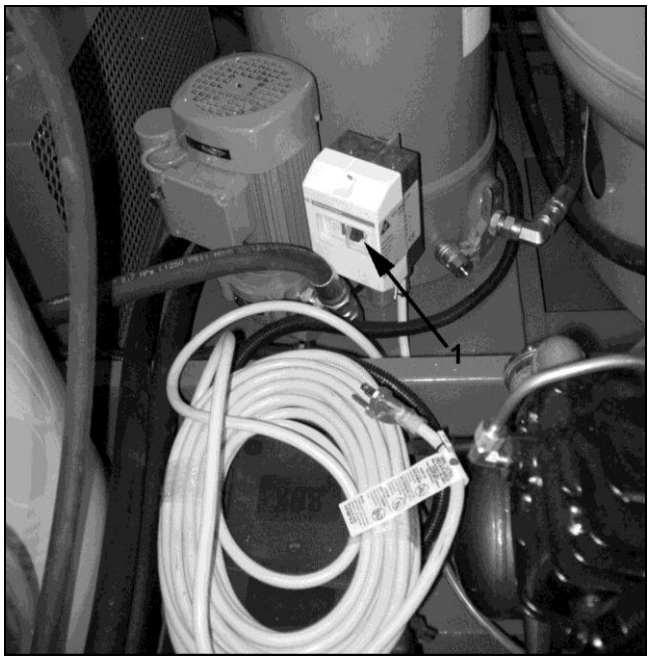


Figure 12 – Filtration System Power Cord

2. Open valve (2) on propane tank.

3. Locate the power cord (3) connected to the water heater and connect cord to a 120 volt power source.

^ WARNING

Carbon Monoxide hazard.

Exhaust from the water heater contains carbon monoxide.

Do not operate the water heater in an enclosed building or confined area.

Avoid any actions or areas that expose you to carbon monoxide.

Open all doors on enclosed trailers.

Figure 13 – Water Heater Power Cord

4. The water heater thermostat is factory set at 160° (maximum setting).

For additional water heater information, refer to the Rinnai manual included with your Sage Oil Vac.

6.5 Basic Fluid Change

6.5.1 Position And Prepare Trailer

1. Position trailer at the base of the tower to avoid right angle parking or any position that will put undue stress on fluid hoses as they are being raised and lowered from the top of the tower.

^ CAUTION

Risk of burn injury.

Equipment engine, filters and fittings may be hot.

Wear appropriate protective devices.

2. If not previously done, create a vacuum in used oil tank. (*Refer to section 6.3.1)*

3. Loosen the new and used product reel locks located on the side of the hand cranks.

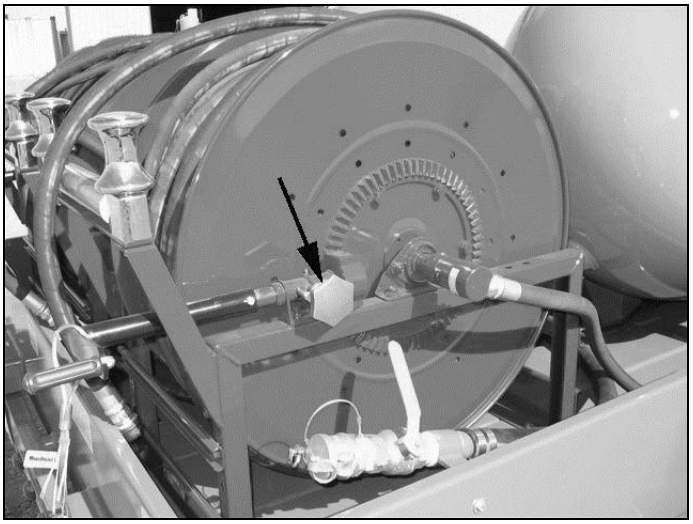


Figure 14 – Reel Lock

4. Pull enough hose out to reach the winch.

5. Connect winch cable to new and used product hose pulls. Flush hose pull can also be connected if desired.

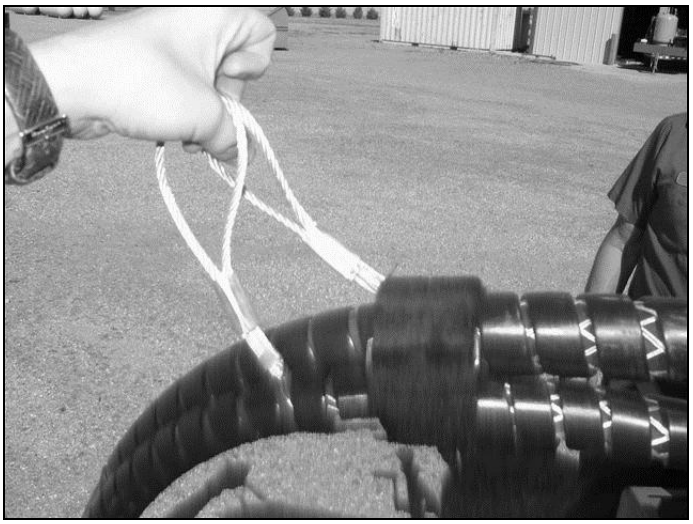


Figure 15 – Hose Pulls

6. Place the Sage Oil Vac Gearbox Adapters and two pipe wrenches in the up-tower transport bag. Connect bag to winch.

6.5.2 Establish Air Pressure In The New Product Tank Or Flush Oil Tank

1. Check the air pressure/vacuum gauge on the appropriate tank. If vacuum exists open the air inlet valve to relieve vacuum.

2. Connect the air hose from the compressor to the appropriate tank.

3. Close the compressor tank drain valves.

4. Place the appropriate 3-way valve in the normal air compressor position. See figure 16.

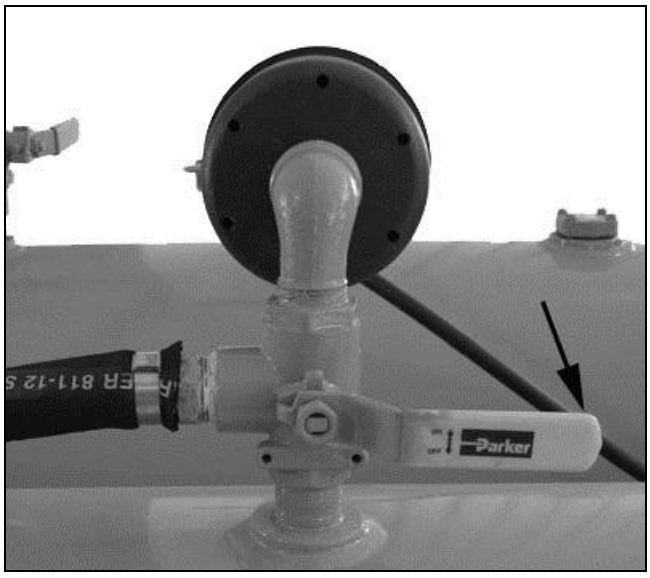


Figure 16 - 3-Way Valve In Air Compressor Position

5. Allow the compressor to bring the tank to optimal air pressure of 60-65 psi. The compressor will reduce engine speed when compressor tank pressure reaches optimum pressure. The tank is now pressurized for fluid transfer.

6.5.3 Move Hoses And Equipment To Top

NOTICE

Hoses can be damaged.

Prevent damage to hoses while pulling to top of tower.

1. Verify there is proper slack in oil hoses before winch is engaged to prevent rubbing or pulling of the hoses.

2. Engage the winch to lift the fluid hoses and other equipment.

3. Ground technician should inspect hoses for lacerations, chunking and worn cover while hose are pulled to the top of the tower.

4. Feed the fluid hoses from the reels to keep pace with the tower winch and avoid strain or pulling on the hoses. Technician should look for kinks and twists in hoses during raising and lowering and do best to alleviate these as they are being raised and lowered.

5. Be certain that hoses and other equipment are not caught or in danger of snagging on tower equipment while hoses are ascending to the top of the tower.

6. When the hoses and equipment reach the top landing, secure the hoses by attaching the hose pulls to the tie-off point.

7. Pull remaining hose off reels. This will ease the oil to flow to and from the tower.

6.5.4 INSTALL GEARBOX ADAPTER

1. Using two pipe wrenches, hold the 2” ball valve (1) located in the at the bottom of the gearbox and remove the plug.

2. Install the gearbox adapter (2) into 2” ball valve and tighten adapter.

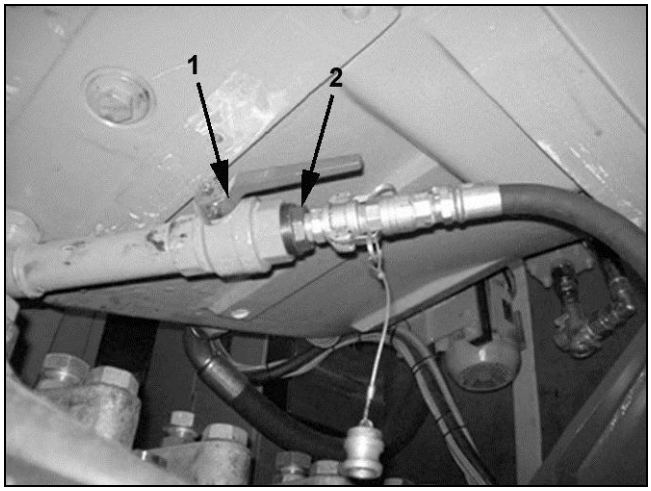


Figure 17 – Gearbox Valve And Adapter

6.5.5 REMOVE USED OIL FROM GEARBOX

1. Identify the used oil hose and connect the hose to the gearbox adapter.

2. Open the 2” ball valve on the gearbox. Then, open the valve located on the used oil hose.

3. Used fluid is now being evacuated to the Sage Oil Vac system on the ground.

4. The tower technician can monitor the progress of evacuation by observing fluid levels drop in inspection glass of gearbox.

5. Refer to the timeline section for expected evacuation times and flow rates.

6. The technician is now free to perform other maintenance during this time.

7. After the oil has disappeared from the inspection glass, the tower technician should remove the inspection cover to observe the remaining progress of the evacuation.

8. Evacuation is complete when gearbox appears to be empty of oil from the inspection opening. Listen for suction through the gearbox and at the trailer. If the vacuum is depleted, the gear box is empty.

9. Upon completion of evacuation, close the 2” ball valve located on the gearbox. Do not close the hose ball valve at this time.

10. Disconnect the used oil hose from the gearbox.

11. Allow the vacuum to continue to remove used fluid from the oil hose. The valve on this hose may be left open for the remainder of the process to ensure all oil is removed from hose.

6.5.6 USING FLUSH OIL SYSTEM

1. Follow the procedure in section 6.5.3 for moving the hose to top of tower. This hose can be pulled up during the time the old oil is being vacuumed out of the gearbox.

2. After the gearbox has been fully drained, disconnect the used oil hose from gearbox adapter and connect the short hose that has the magnet, in-line filter and meter to the gearbox. Connect the flush hose from trailer to the short filtration hose.

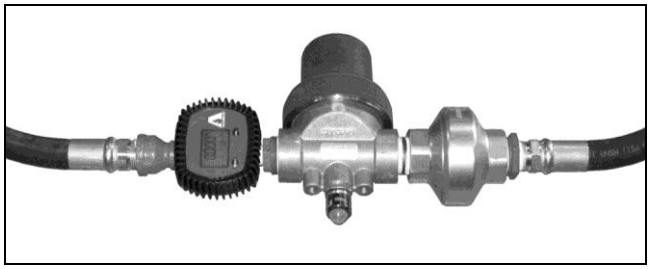


Figure 18 – Short Filtration Hose

3. Selector switch (1) must be in the Neutral position.

Fluid Pump Selector
Gear Oil Pump
Flush Oil Pump
Neutral
When starting drive motor, ensure selector is in Neutral Position.
When not in use leave selector in neutral to save battery.

Figure 19 – Selector Switch

4. Start the pump engine (see section 6.2.1 for instructions on starting engine). Refer to the troubleshooting section if you have difficulty starting the engine.

5. Once the pump is running, move selector switch (1) to FLUSH oil. Turn pressure regulating valve (2) clockwise to increase flow to the main fluid line to the gearbox. Turn valve until pressure level on gauge (3) is between 500 and 950 psi. Do not exceed 950 psi.

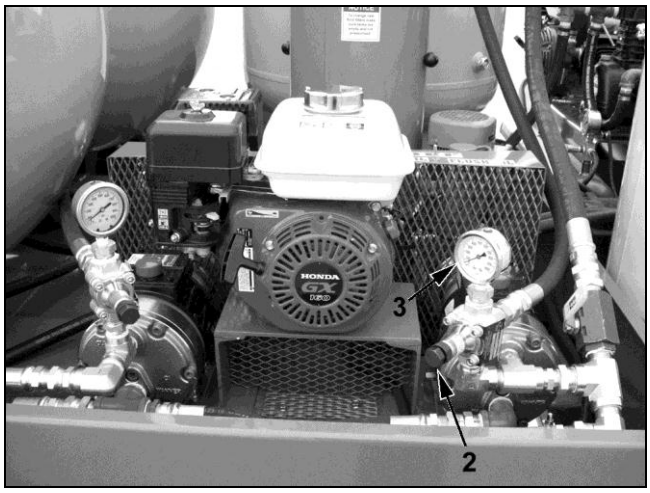


Figure 20 – Pressure Regulating Valve

6. After the pump has been shut off, close the both ball valves uptower. The tower technician should now start the circulation process with the flushing oil. During that process, disconnect the short hose with the magnet, filter, and meter from between the end of the long hose and the gearbox.

   Note: This hose now has fluid in the hose, filter, and magnet. Connect long hose to the gearbox. The flush oil will be vacuumed back into the original tank.

7. Follow procedure 6.3.1 to establish vacuum in the flush oil tank. The flush oil will be vacuumed back into the flush oil tank so it can be reused.

8. Open the 1'' ball valve (4) near the flush oil pump. This allows the flush oil to bypass the pump and go into the tank.

Figure 21 – Flush Oil Ball Valve

9. When the circulation process is completed, open the 1" ball valve at the top to begin vacuuming the flush fluid into the flush oil tank. Alert the ground technician that vacuuming has begun. Listen for suction through the gearbox and at the trailer. Allow all of the flush oil to be vacuumed from the hose and allow tank to drop to zero vacuum.

10. After all of the flush oil is removed and the tank vacuum goes to zero, close the 1" ball valve.

11. Follow procedure 6.5.7 to begin refilling the gearbox with the final product.

6.5.7 Filling Gearbox With New Oil

1. Identify the new fluid hose and connect hose to the gearbox adapter.

2. Selector switch (1) must be in the Neutral position.

Fluid Pump Selector
Gear Oil Pump
Flush Oil Pump
Neutral
When starting drive motor, ensure selector is in Neutral Position.
When not in use leave selector in neutral to save battery.

Figure 22 – Selector Switch

3. Reset the meter to zero by pressing the reset button. Open the 2" ball valve on the gearbox.

4. Open the ball valve on the new fluid hose. The tower technician radios to the ground technician to start pumping the new oil.

5. Start the pump engine (see *section 6.2.1 for instructions on starting engine).* Refer to the troubleshooting section if you have difficulty starting the engine.

6. Once the pump is running, move selector switch (1) to GEAR oil. Turn pressure regulating valve (2) clockwise to increase flow to the main fluid line to the gearbox. Turn valve clockwise until pressure level on gauge (3) is between 500 and 950 psi. Do not exceed 950 psi.

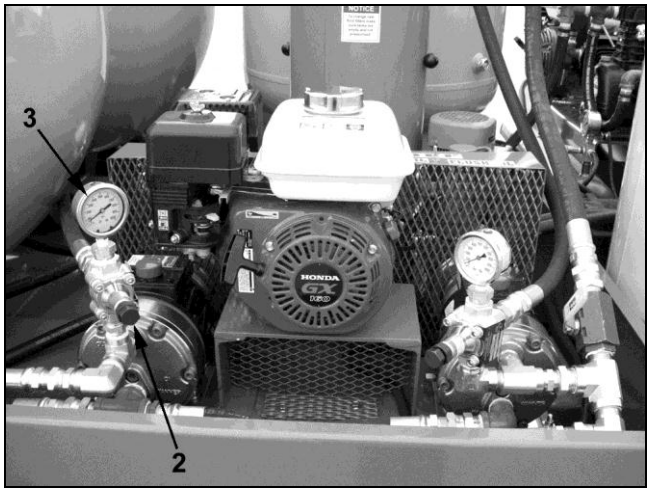


Figure 23 – Pressure Regulating Valve

7. Contact the tower technician to verify there is a flow of new gear oil to the gearbox.

8. Continue the pumping process to until the tower technician indicates that the gearbox is full. Stop the pumping process by turning off the pump engine.

9. Start the circulation pump to move the new fluid throughout the gearbox.

10. Top off the gearbox fluid level if necessary.

11. Close the 2" valve on the gearbox and the valve on end of the new fluid hose.

6.5.8 COMPLETING GEARBOX OIL CHANGE

1. Remove the Sage Oil Vac Gearbox Adapter ***after*** the gearbox has an acceptable level of oil.

2. The tower technician will notify the ground technician that they are about to lower the product hoses with the tower winch.

3. While the hoses are being lowered, the ground technician should keep pace with the lowering winch by winding the product hoses onto the product hose reel. Technician should look for kinks and twists in hoses during lowering and do best to alleviate these as they are being lowered. Uniformly roll hose onto reel by "fanning" or moving hoses from one side of the reel while rolling up.

4. Place the product hoses in a secure location and tighten reel locks to prepare for travel.

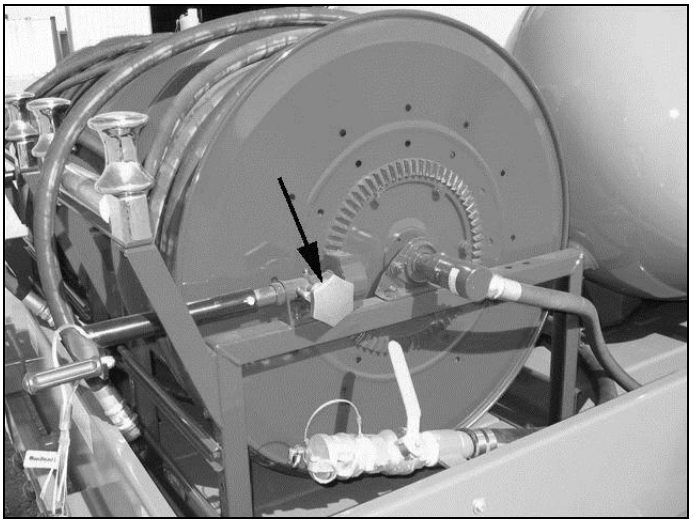


Figure 24 – Reel Lock

6.6 USED PRODUCT DISPOSAL

See section 10 for agencies you may contact regarding waste oil disposal in your state.

This outlines the disposal of waste product at authorized disposal sites. This outline assumes that the disposal hose assembly is attached to the disposal vessel. This procedure will vary depending on site conditions.

- Identify the proper used product receptacle for each fluid type for disposal.
- Relieve vacuum from the used product tank if vacuum exists.
- Connect hose (1) to the used product connector and to used product disposal receptacle. Verify the both connections are secure using the cam-lock connectors.
- Connect the compressor air supply hose to the used product tank air inlet and open the air inlet valve.
- Open the used product tank discharge valve (2) to start evacuation of waste fluids.

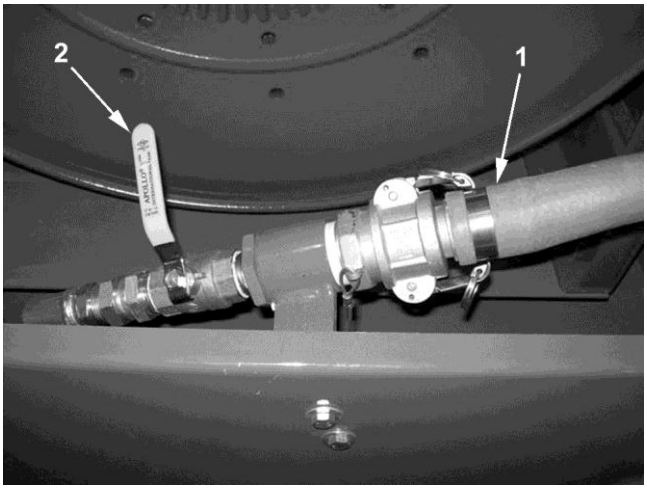


Figure 25 – Off-Load

- Start compressor to pressurize the used product tank.
- Monitor the fluid level gauge on the used product tank until the tank is empty. Allow air pressure to purge the disposal hose.
- Close the used product tank air inlet valve.
- Close the used product tank discharge valve
- Disconnect the used product disposal hose and replace the cam-lock cap.
- Wipe up any dripped or residual fluids that remain.

Note: Repeat the above indented steps for each used product tank to be emptied. In some cases, such as centralized disposal sites, multiple tanks and multiple products may be disposed simultaneously.

6.7 CHANGING FLUIDS

When changing from one type of new fluid to another in the Sage Oil Vac, it is necessary to do the following procedures to purge as much fluid from the machine.

1. Park the trailer on a steep incline, with the hitch end at the low point and reels at the high point.

2. Pull all 300 feet of new oil hose straight out the back and lay on the ground. Remove the meter from the new oil hose to prevent air pressure from destroying the meter. Place end of hose in a bucket and have a second bucket ready for use. Open ball valve on end of hose.

3. Pressurize new oil tank to 30 to 40 psi. Start new fluid pump and allow to run until no pressure/or pump eases up. Turn engine off immediately.

4. Remove the hose leading from the pump to the new oil reel. Install in the reel, where the new oil is introduced, an air coupler by which you can now pressurize the reel and hose with 100 psi. This air will force all oil in the reel and hose out. Allow air to run through until all oil has been purged. Open and close the ball valve several times to allow any oil to settle and then be forced out. Someone can also “walk the hose” starting at the reel end and lifting to waist high, thereby chasing the oil to the far end.

5. Re-install meter and close ball valves. Hoses are now ready to be rolled back onto reel.

6. Remove air coupler and re-install hose back to the pump.

Procedure for removing oil from filtration system.

1. Install ½ hose with hose barb (provided) into the ball valve located on bottom of filtration system. Place black rubber hose into bucket.

2. Pressurize new fluid tank to 30 psi. Open ball valve and allow oil in filtration system to purge. When oil stops flowing, close ball valve, wait two minutes, and repeat process. The filters are slow in giving up the oil, but taking our time here, to allow as much oil to be purged, will save a big mess in the containment pan. Be sure to put down disposable oil absorbent pads.

3. Follow instructions for changing filters as per C.C. Jensen instruction manual.

4. Close ball valve on bottom of filtration and remove short hose with hose barb.

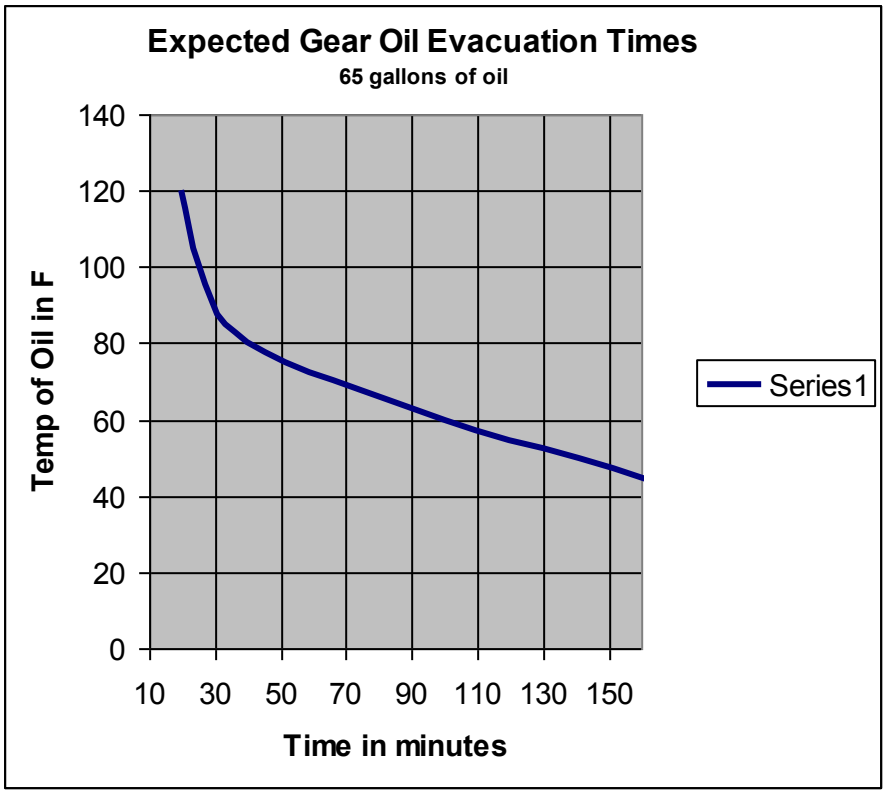
The first time out after changing from one oil type to another, it is a good idea to pump the first 4 to 5 gallons into a waste receptacle to flush out any fluid that was left in the pump or hoses.

6.8 TIME TO EVACUATE 65 GALLONS OF GEAR OIL

Used Oil Evacuation

To evacuate 65 gal. of oil

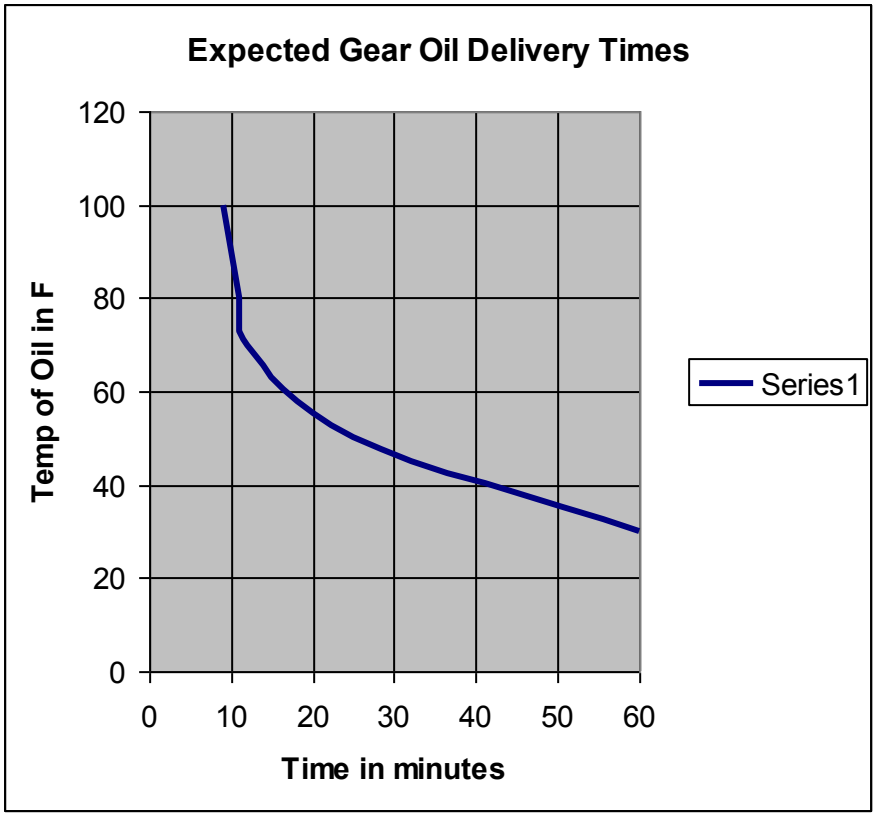
Minutes	Temperature
20	120
25	100
40	80
100	60
175	40
185	20
200	0



Fresh Fluid Delivery

To deliver 65 gal. of oil

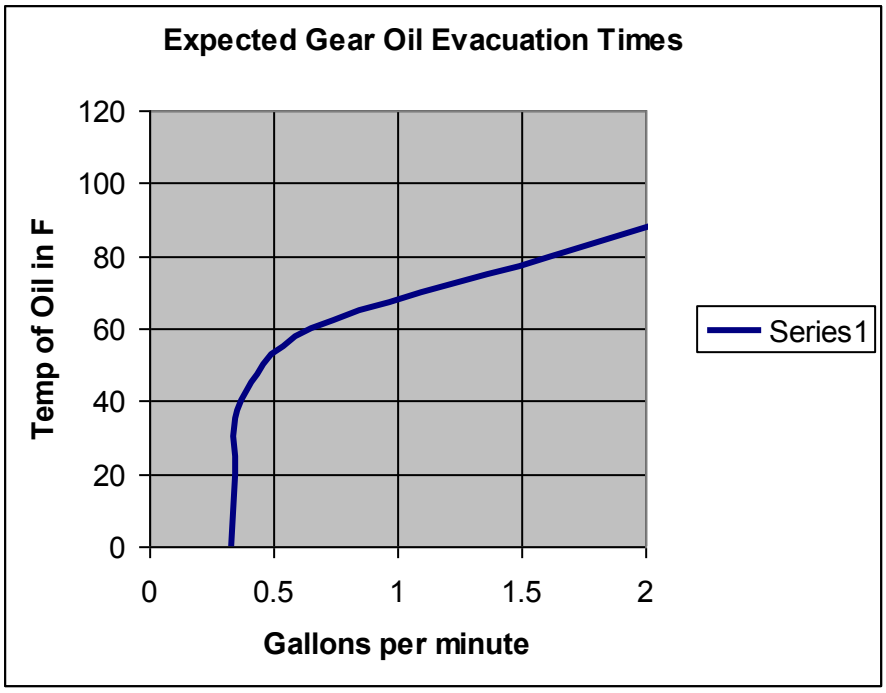
Minutes	Temperature
9	100
10	90
11	80
12	70
25	50
60	30



6.9 GALLONS PER MINUTE

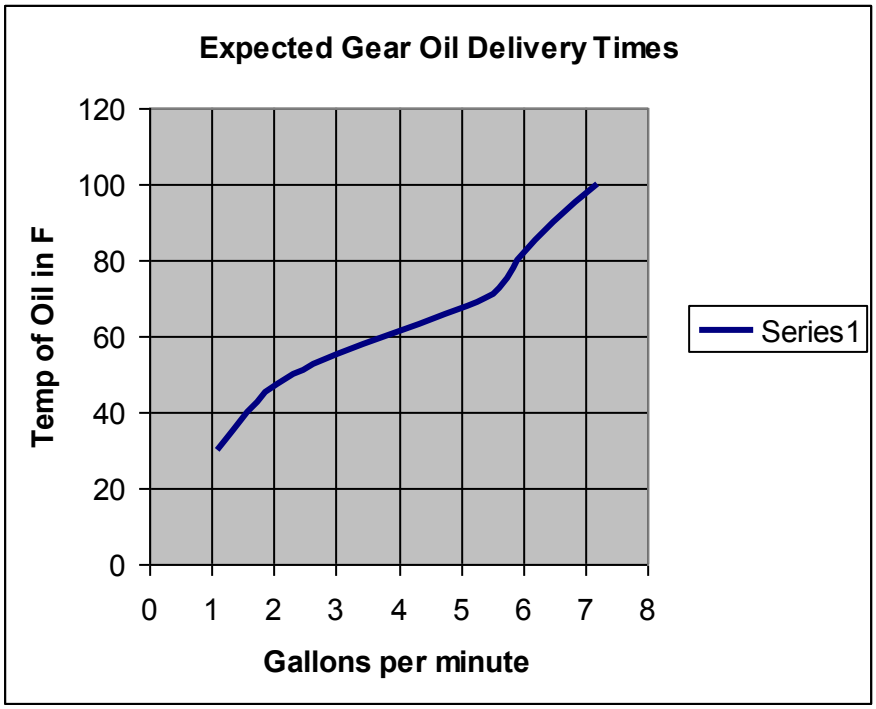
Used Oil Evacuation

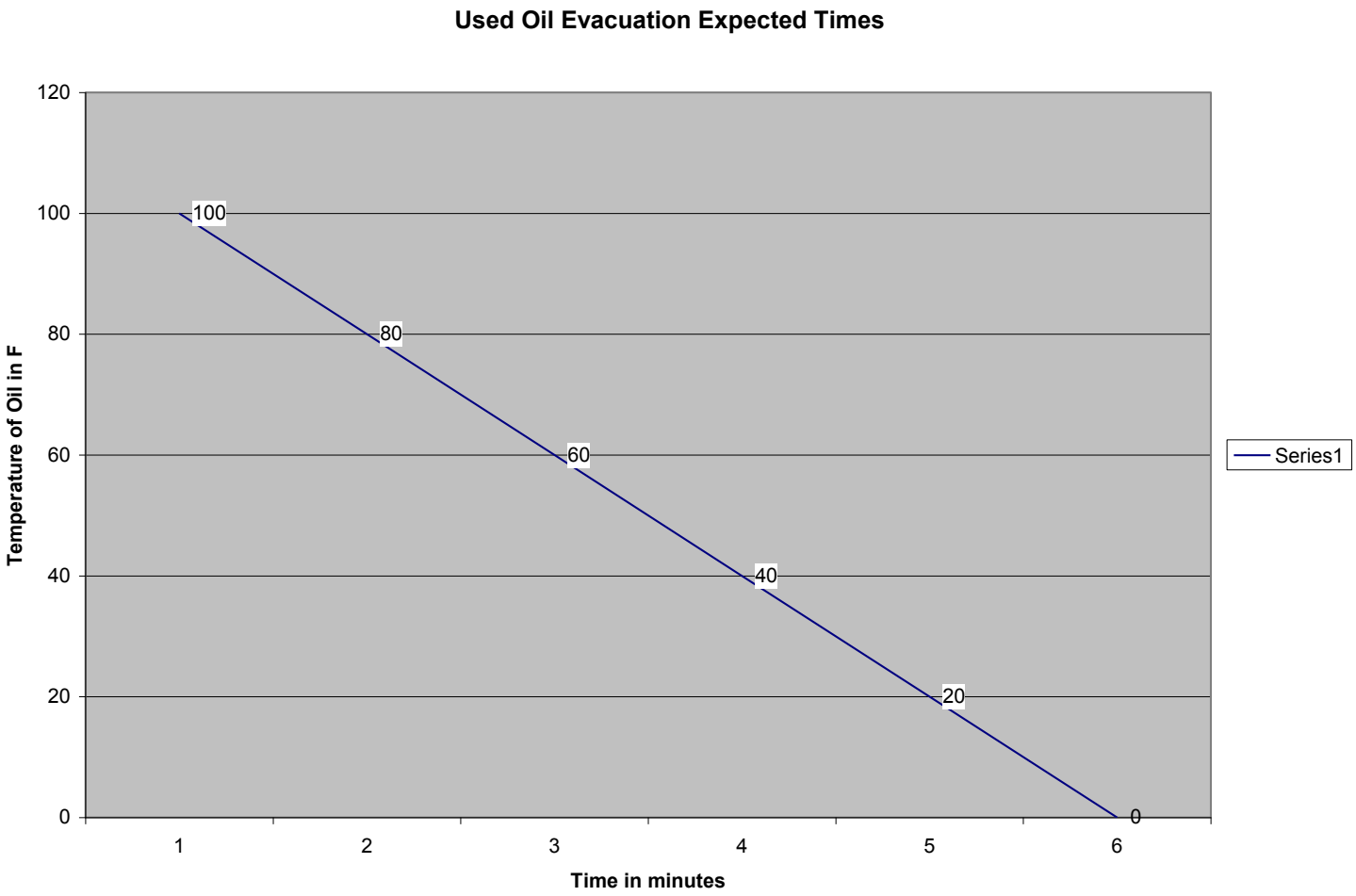
GPM	Temperature
3.25	120
2.6	100
1.62	80
0.65	60
0.37	40
0.35	20
0.33	0



Fresh Fluid Delivery

GPM	Temperature
7.2	100
6.5	90
5.9	80
5.4	70
2.3	50
1.1	30




Used Oil Evacuation Expected Times
Temperature of Oil in F
120
100
80
60
40
20
0
100
80
60
40
20
0
1
2
3
4
5
6
Time in minutes
Series1

7 DRAWINGS AND PARTS

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This section contains exploded view drawings, spare parts and part numbers for the Sage Oil Vac System. For spare parts on the compressor engine, see your engine manual or dealer.

7.1 AIR COMPRESSOR

7.1.1 AIR TANK

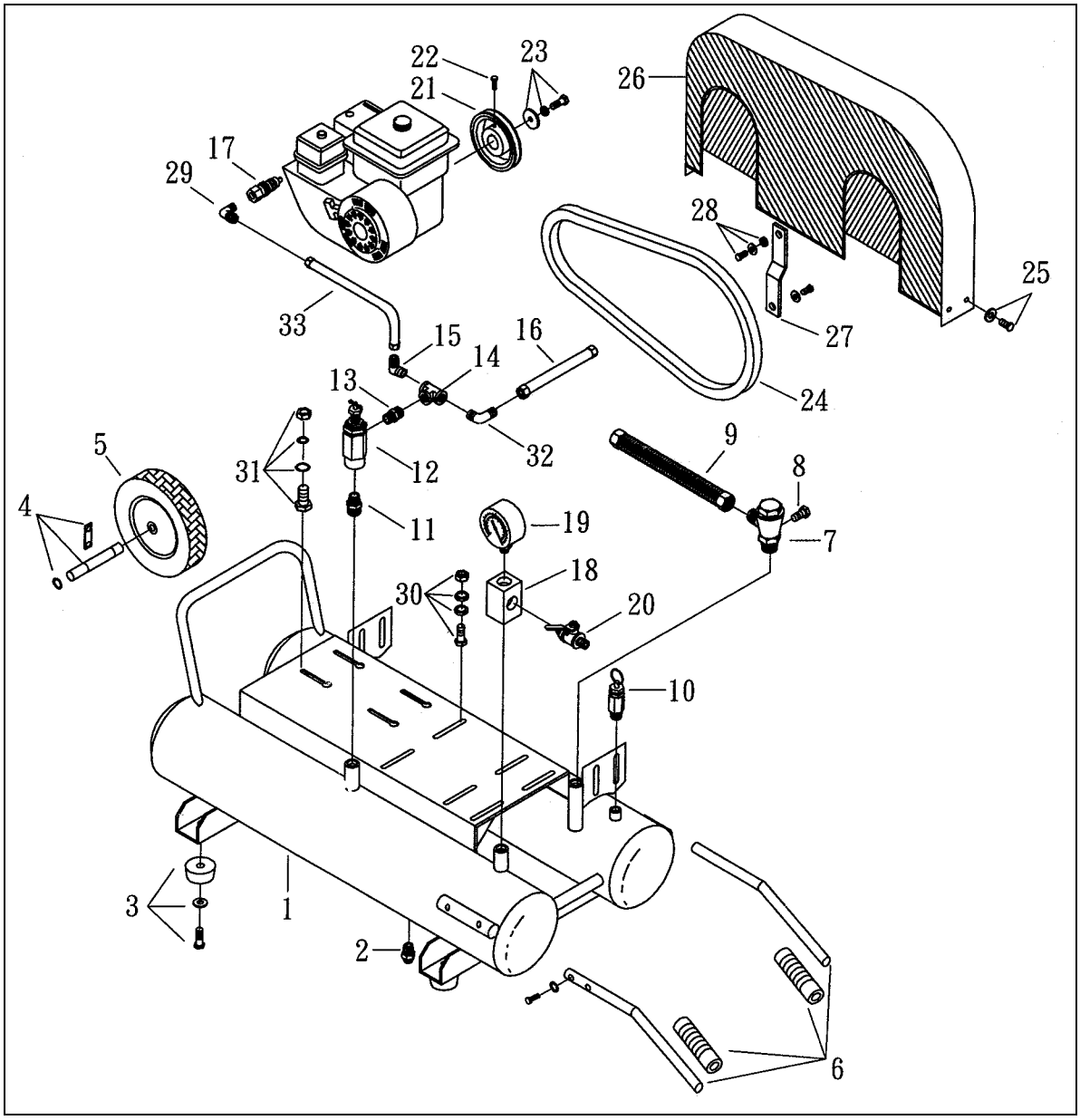

Figure 7.1.1 - Air Tank

Air Tank Spare Parts List

Item Number	Part Number	Description	Quantity	Notes
1	3401093	Air Tank	1	
2	2402011	Drain Valve	2	
3	2433015A	Rubber Pad Set	4	
4	2418022A	Tank Wheel Set	1	
5	2402032B	Tank Wheel	1	
6	3432008-8	Grip Set	1	
7	2414025T	Check Valve	1	
8	2N33-001	Plug	1	
9	3B2-04*440	Exhaust Tube Set	1	
10	2406018T	Pressure Relief Valve	1	
11	2N01-002	Nipple	1	
12	240007	Unloading Valve	1	
13	2N01-01N01N	Nipple	1	
14	2N03-C111NF	Brass 3-Way Pipe	1	
15	2N16-C01TW02M	Elbow	1	
16	3B2-02*350N	Unloading Tube Set	1	
17	2423034	Idling Device	1	
18	2N04-C2234N	Brass 4-Way Pipe	1	
19	2D12-25V20KL	Pressure Gauge	1	
20	2413020	Ball Valve	1	
21	3PGF-040A1W0615	Engine Pulley	1	
22	2B07-SM08*015W	Hex Bolt	2	
23	2B00-FW25S*10V	Hex Bolt Set	1	
24	2N31-A50	V-Belt	1	
25	2B00-FM08*015W	Hex Bolt Set	5	
26	3426013	Belt Guard	1	
27	3427043	Bracket	1	
28	2B00-MF06*020VW	Hex Bolt Set	1	
29	2N16-C01NW02M	Elbow	1	
30	2B08-FM08*30-M	Motor Feet Bolt Set	4	
31	FM08-*42-G	Motor Feet Bolt Set	4	
32	2N06-01T02H	Unloading Tube	1	
33	2T03-W02*0350G	Tube	1	

7.1.2 AIR COMPRESSOR PUMP

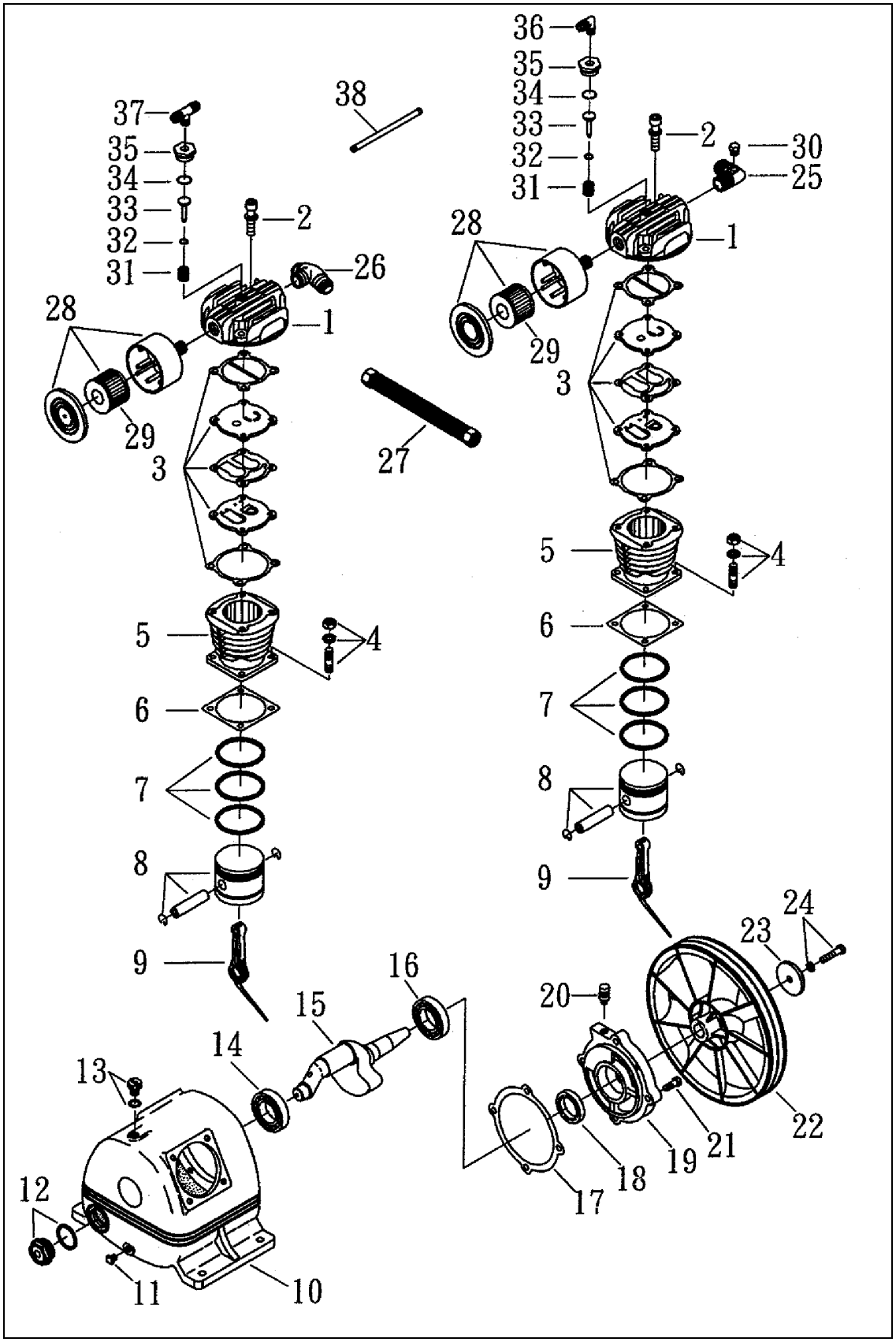

Figure 7.1.2 - Air Compressor Pump

Air Compressor Pump Spare Parts List

Item Number	Part Number	Description	Quantity	Notes
1	3101055	Cylinder Head	2	
2	2B01-M06*040V	Allen Bolt Set	8	
3	3B13-AC0765	Intake & Exhaust Valve Assembly	2	
4	2B11-001-A	Double Head Screw Set	8	
5	3201035	Cylinder	2	
6	2G04-003	Cylinder Gasket	2	
7	3B32-65	Piston Ring Set	2	
8	3B31-65	Piston Set	2	
9	3B33-H20601	Rod Set	2	
10	3301015	Crankcase	1	
11	2N33-001	Oil Draining Plug	1	
12	2303014A	Oil Sight Gauge Set	1	
13	2319003A	Oil Filling Plug Set	1	
14	2N35-6204	Bearing	1	
15	3304038	Crankshaft & Balancer	1	
16	2N35-6205Z	Bearing	1	
17	2G06-008	Rear Bearing Seat Gasket	1	
18	2N50-TC24*47*07	Oil Seal	1	
19	3311015	Rear Bearing Seat	1	
20	2321002	Breather Cover	1	
21	2B00-SM08*020	Hex Bolt	4	
22	3PBF-105A124	Pulley	1	
23	2B30-08*35*35	Plate Washer	1	
24	2B30-08*035AV	Hex Bolt Set	1	
25	2N06-04T04H02T	Exhaust Elbow	1	
26	2N09-04H04T04H1	Exhaust 3-Way Pipe	1	
27	3B2-04*240	Exhaust Tube Set	1	
28	2140020A	Air Filter Set	2	
29	2142013	Filter Element	2	
30	2N33-002	Plug	1	
31	2S03-001	Unloading Spring	2	
32	2N52-P06V	O-Ring	2	
33	2113006	Unloading Piston	2	
34	2N52-P16*3V	O-Ring	2	
35	2B26-001	Unloading Nut	2	
36	2N06-01T02H	Unloading Elbow	1	
37	2N09-02H01T02H4	Unloading 3-Way Pipe	1	
38	3B2-02*475N	Unloading Tube Set	1	

7.1.3 WATER TRAP/AIR REGULATOR

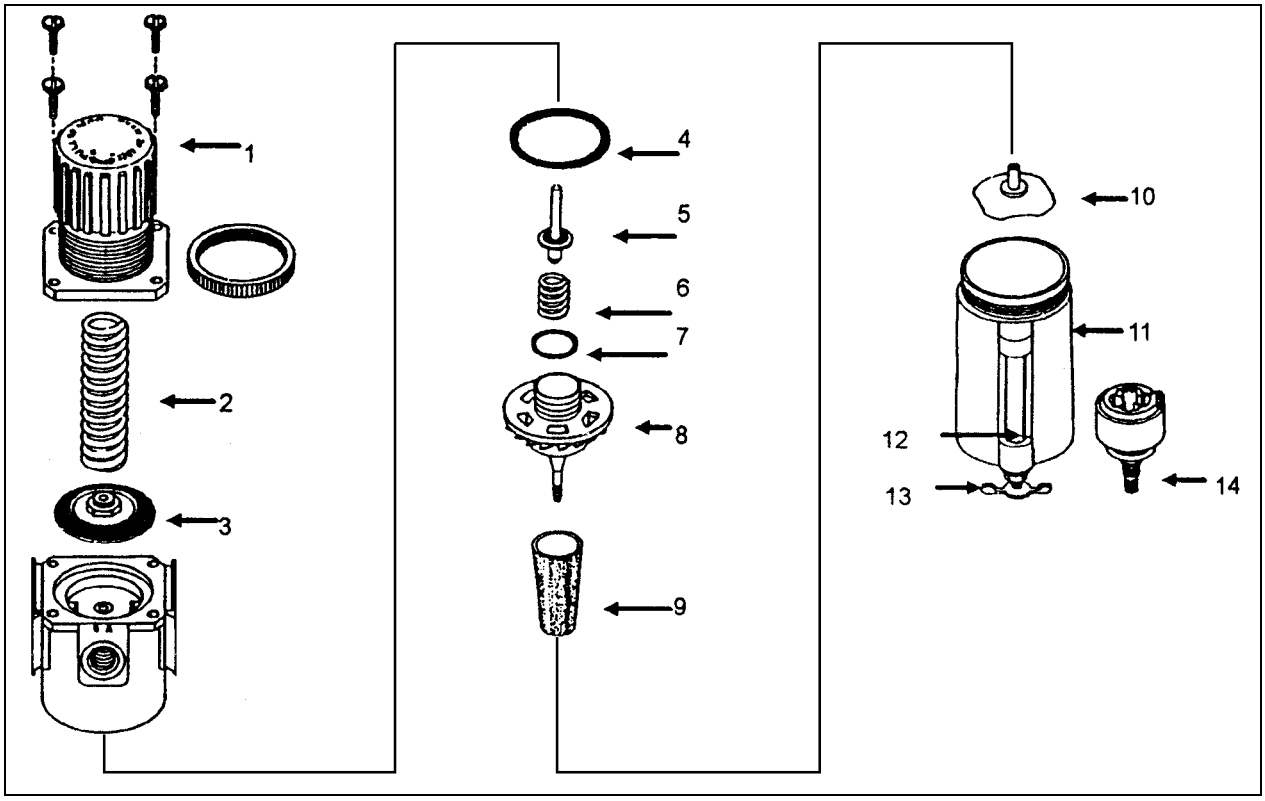

Figure 7.1.3 - Water Trap/Air Regulator

Item Number	Part Number	Description	Quantity	Notes
	AC-754-001	Water Trap/ Air Regulator (Complete)	1	
1	SC35	Regulator Bonnet Repair Kit	1	
	SC35T	Regulator Bonnet Repair Kit (T-Handle)	1	
2	SK35	Adjustment Spring	1	2-125
	SK35L	Adjustment Spring	1	2-60
	SK35H	Adjustment Spring	1	2-250
3	DK35	Diaphragm Repair Kit		Relieving
	DK35N	Diaphragm Repair Kit		Non-Relieving
5, 6, 7, 8, 10	VKB75	Valve Kit		
9	EK35 (Std)	Element		40 Micron
	EK35-3	Element		3 Micron
	EK35-5	Element		5 Micron
	EK35-20	Element		20 Micron
	EK35-90	Element		90 Micron
11	BKF35	Bowl Kit, Plastic	1	
	BKF45M	Bowl Kit, Metal	1	Inc 4, 11, 13
	BKF45W	Bowl Kit, Metal		Inc 4, 11, 12, 13
14	5200	Auto Drain Kit	1	Optional
	AC-000-002	Mounting Bracket	1	

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7.2 New and Used Fluid Tanks

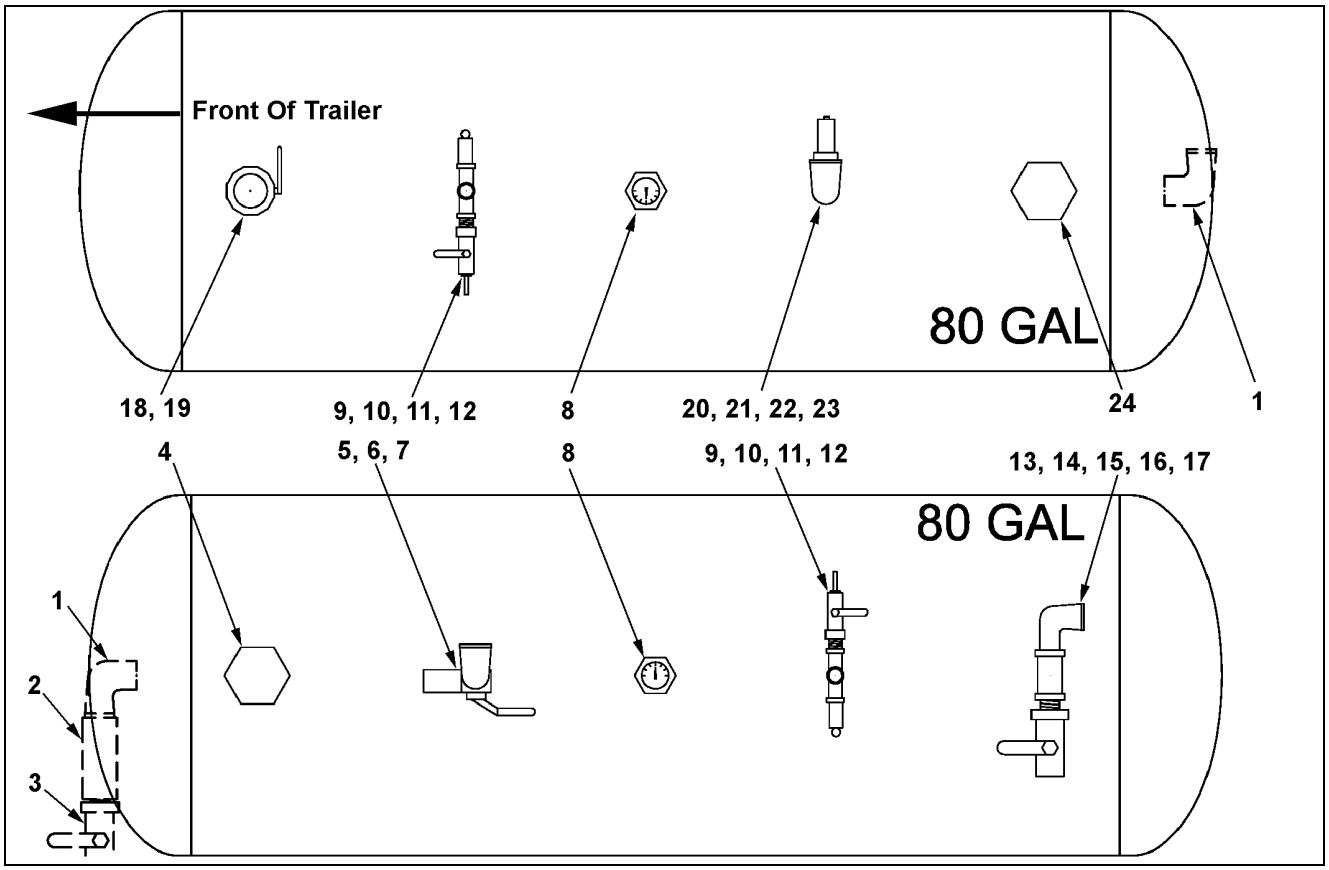

Figure 7.2 - 80 Gallon Tank Fittings

Item Number	Part Number	Description	Quantity	Notes
1	PF-016-005	1" Street L	2	
2	PF-016-015	1 x 12" Nipple	1	
3	BV-016-001	1" Ball Valve	1	
4	PF-032-010	2" Plug	1	
5	PF-012-005	¾" Check Valve	1	
6	BV-012-002	¾" 3-Way Ball Valve	1	
7	PF-012-004	¾" Street L	1	
8		Gauge	2	
9	BV-004-003	¼" Ball Valve	1	
10	PF-004-014	¼" 4-Way Cross	1	
11	PF-004-011	¼" Male Coupling	1	
12	PF-004-001	¼ x 1-1/2" Nipple	2	
13	PF-032-003	¾ x 2" Bushing	1	
14	PF-012-001	¾" Close Nipple	1	
15	PF-012-011	¾" Tee	1	
16	PF-012-004	¾" Street L	2	
17	BV-012-001	¾" Ball Valve	1	
18	PF-032-005	2" Close Nipple	1	
19	BV-032-001	2" Ball Valve	1	
20	PF-012-008	¾ x ½" Bushing	1	
21	PF-008-003	½" Street L	1	
22	PF-008-001	½" Close Nipple	1	
23	HF-008-001	Pioneer Male Coupler	1	
24	PF-032-010	2" Plug	1	

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7.3 METERS AND HANDLES

7.3.1 ELECTRONIC-METERED CONTROL VALVE

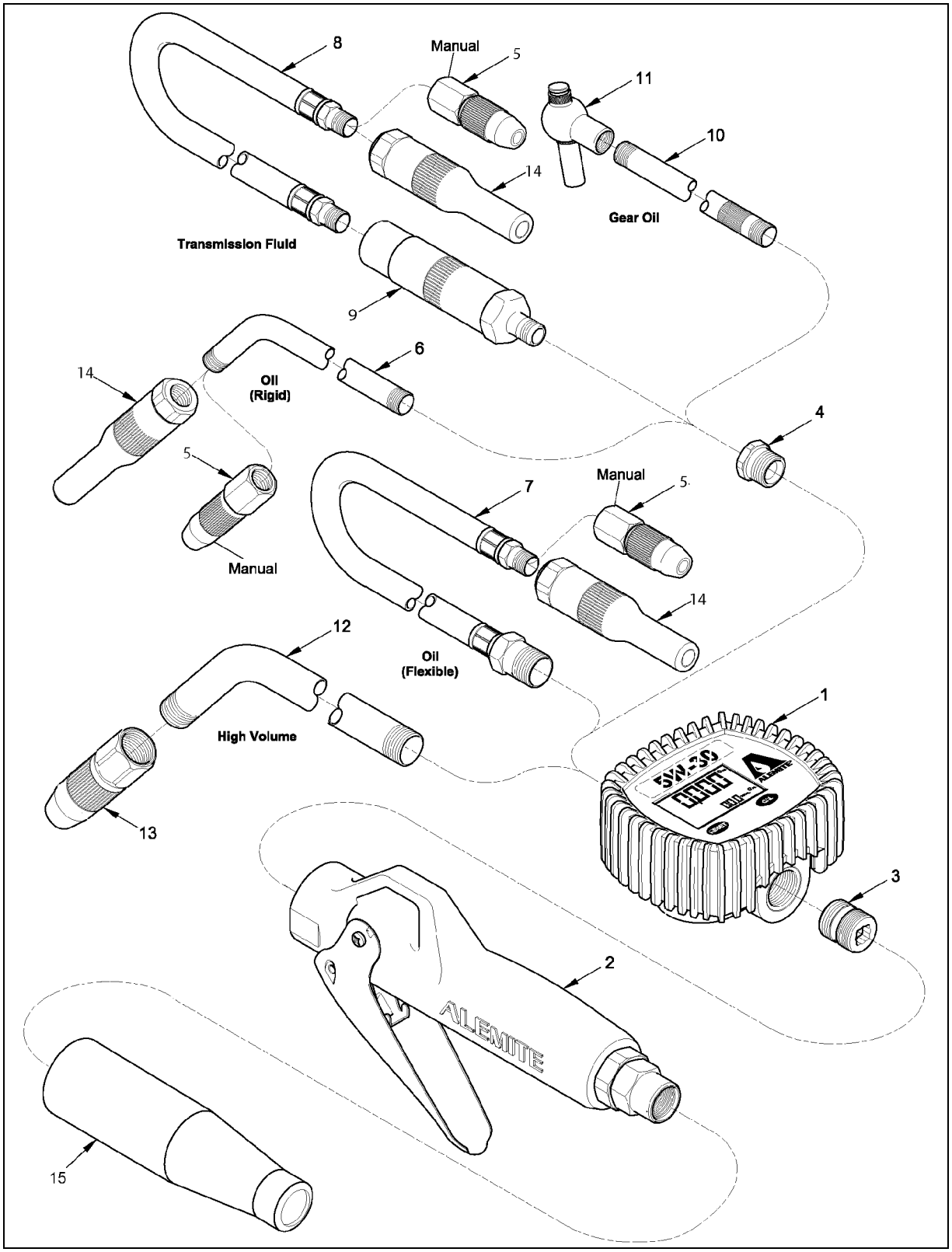

Figure 7.3.1 - Electronic-Metered Control Valve

Item Number	Part Number	Description	Quantity	Notes
1	AA-367-001	Meter Assembly	1	Includes 2, 3, 5, 7, 15
2	339100	Handle Assembly	1	
3	338706	Nipple, ½" (NPTF)	1	
4	51891	Bushing, ½" (NPT) x ½" (NPT)	1	
5	339084	Nozzle, Manual	1	
6	338702	Extension, Curved	1	
7	338709	Hose, ½" NPT x ½" NPT	1	
8	317860-1	Hose, ¼" NPT x ¼" NPT	1	
9	321203	Filter Assembly (40 Micron)	1	See Section 7.5.2
10	320421	Extension, Straight ¼" NPT	1	
11	318400-2	Nozzle, Automatic W/Manual Lock	1	See Section 7.5.3
12	339149	Extension, Curved ½" NPT	1	
13	340084	Non-Drip Nozzle, High Volume Manual	1	
14	B339800	Non-Drip Nozzle, Automatic		
15	340626	Swivel Protector		
	340626-1	Swivel Protector, Black		
	340626-2	Swivel Protector, Yellow		
	340626-3	Swivel Protector, Green		
	340626-4	Swivel Protector, Red		
	340626-5	Swivel Protector, Blue		

7.3.2 METER FILTER ASSEMBLY

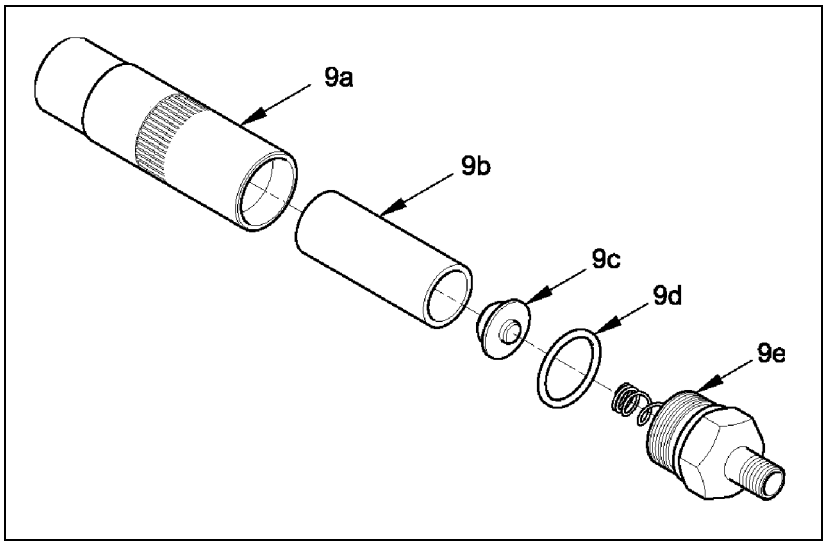

Figure 7.3.2 - Meter Filter Assembly

Item Number	Part Number	Description	Quantity	Notes
9a		Body	1	
9b	321191	Filter Tube	1	
9c		Stud	1	
9d	X171001-14	O-Ring, ¾" ID x 15/16" OD	1	Package Of Ten
9e		Spring and Adapter Assembly	1	

7.3.3 METER NOZZLE

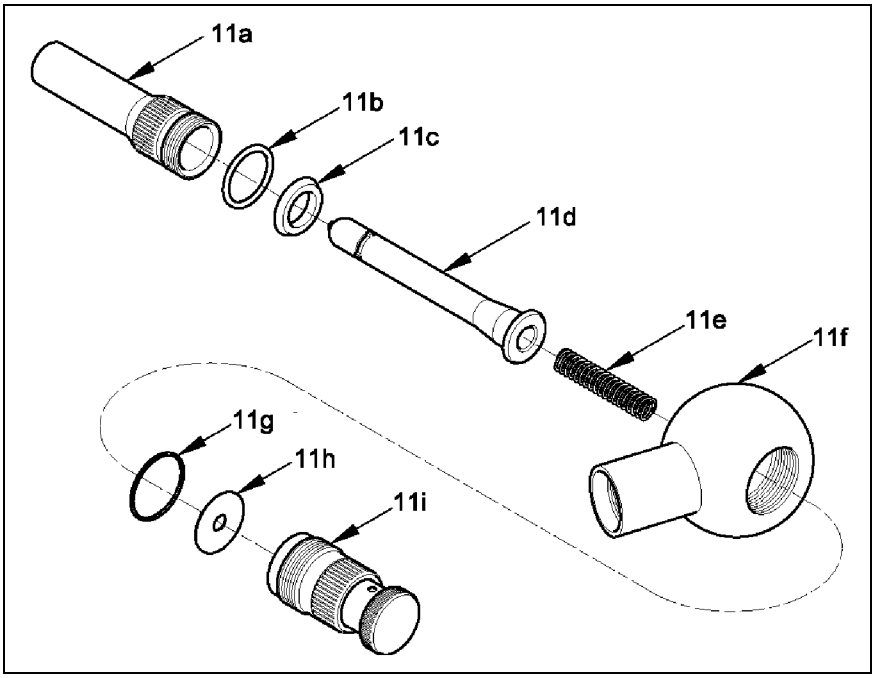

Figure 7.3.3 - Meter Nozzle Assembly

Item Number	Part Number	Description	Quantity	Notes
11a	3679	Nozzle	1	
11b	339100	O-Ring, ½" ID x 5/8" OD	1	Order Kit 393518
11c	338706	V-Block	1	Order Kit 393518
11d	51891	Stem	1	Order Kit 393518
11e	339084	Spring	1	Order Kit 393518
11f	338702	Body, Angle	1	
11g	338709	Gasket	1	Order Kit 393518
11h	317860-1	Washer	1	Order Kit 393518
11i	321203	Screw Assembly	1	

7.3.4 METER HANDLE

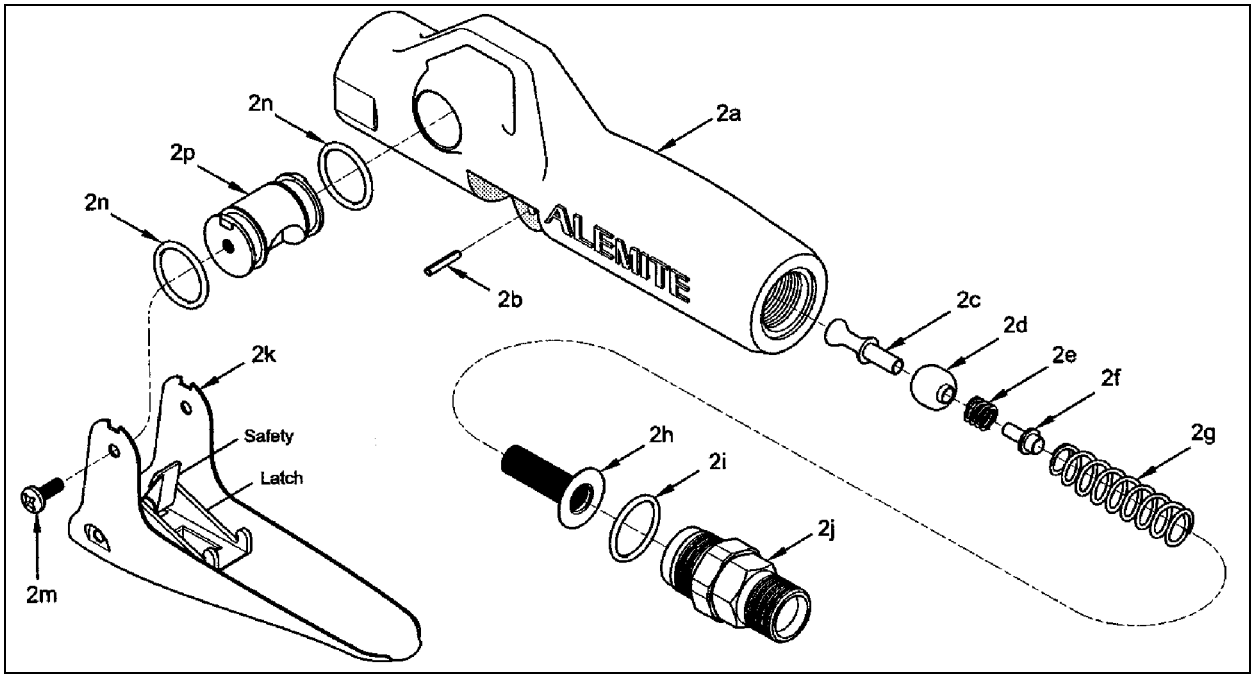

Figure 7.3.4 - Meter Nozzle Assembly

Item Number	Part Number	Description	Quantity	Notes
2a		Body	1	Order 339100
2b		1/8 x 5/8” Roll Pin	1	Order Kit 393676
2c		Push Rod	1	Order Kit 393676
2d		Seal	1	Order Kit 393676
2e		Spring, Small	1	Order Kit 393676
2f		Spring Support	1	Order Kit 393676
2g	339063	Compression Spring	1	
2h	339064	Strainer (40-Mesh)	1	
2i	X171009-17	13/16” ID x 1” OD O-Ring	1	Also In Kit 393676
2j	339656	Swivel Assembly	1	
2k		Lever Assembly	1	Order Kit 393677
2m		10-24 x 3/8” Screw	2	Order Kit 393676 or 393677
2n	X171000-10	1/2” ID x 11/16” OD O-Ring	2	Also In Kit 393676
2p	339055	Cam	1	

7.4 TRAILER

Figure 7.4 Trailer Components

Item Number	Part Number	Description	Quantity	Notes
1	BX-034-001	Tool Box	1	
2	FA-002-001	2” Coupler	1	
3	FA-000-004	3/8” Safety Chain	2	
4	FA-005-014	5000 lb. Swivel Jack	1	
5	LW-002-003	Lamp (Amber)	2	
6	FA-015-001	Tire and Rim Assembly	2	
7	LW-02-004	Lamp (Red)	2	
8	LW-000-003	License Plate Lamp	1	
9	LW-000-014	Brake/Turn Lamp	2	
10	FA-003-004	3500 lb. Rubber Torsion Axle	1	

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7.5 FILTER STINGER

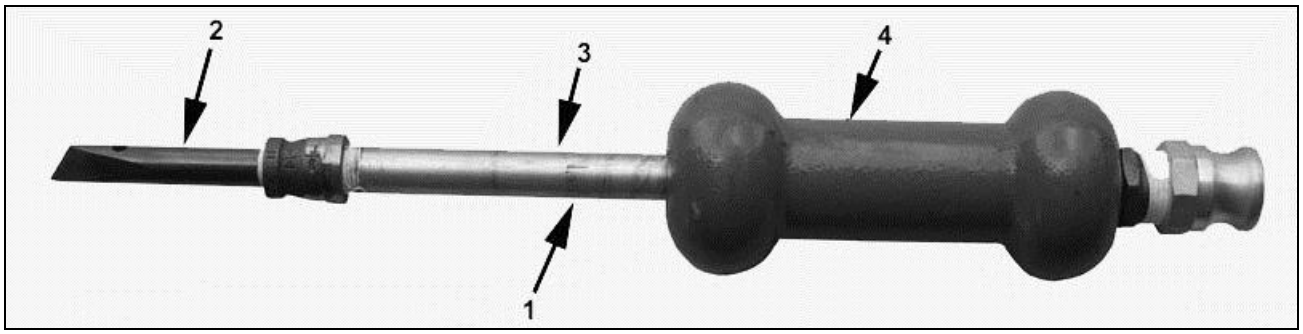

Figure 7.5 - Filter Stinger

Item Number	Part Number	Description	Quantity	Notes
1	MA-008-001	Filter Stinger Assembly	1	Complete Assembly
2	PF-006-007	Tungsten Filter Poker	1	
3	PF-006-007	3/8 x 12” Galvanized Nipple	1	
4	PF-005-001	5 lb. Slide Hammer	1	

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7.6 BARREL STRAW

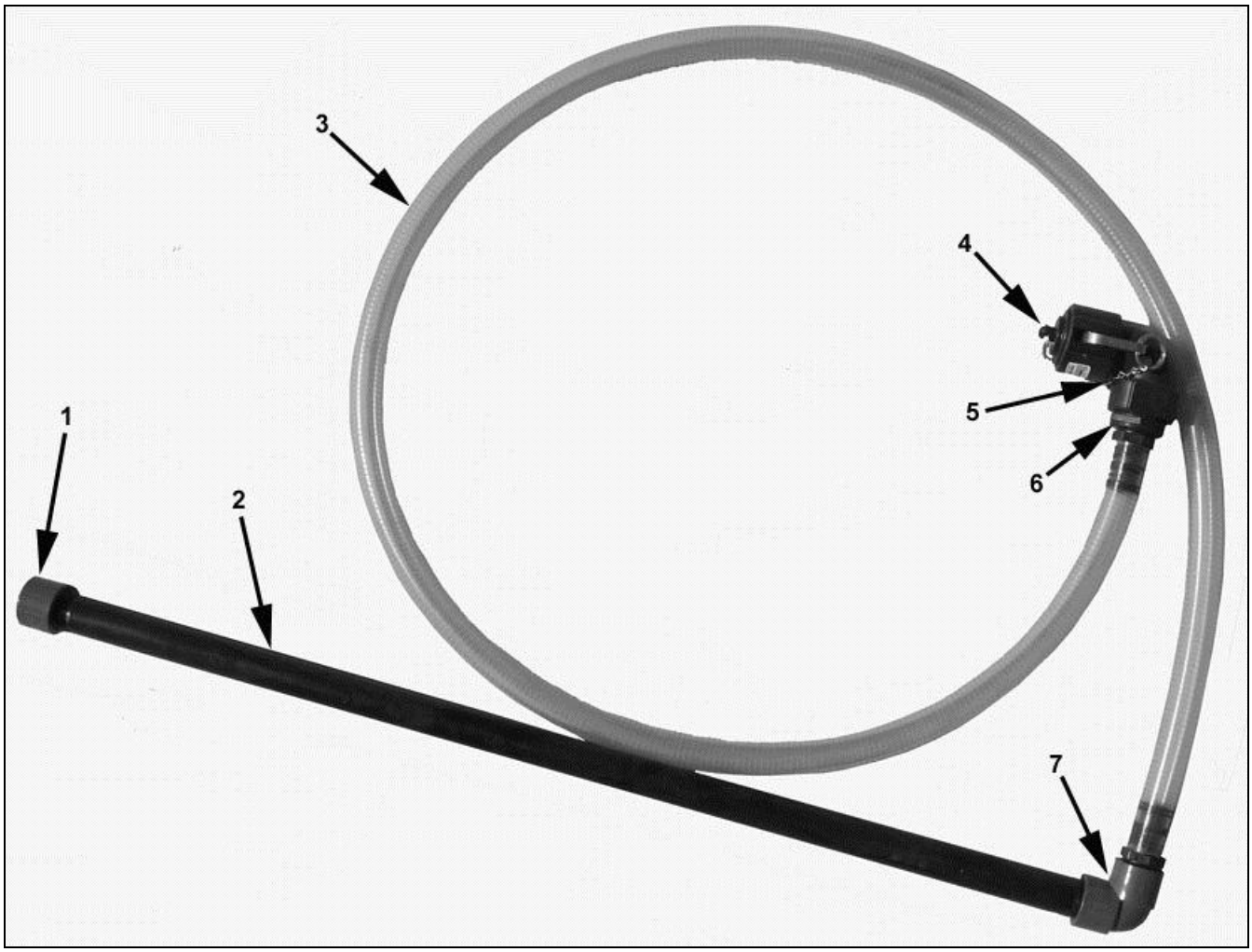

Figure 7.6 - Barrel Straw

Item Number	Part Number	Description	Quantity	Notes
1	PF-020-023	1-1/4” PVC Female Cap	1	
2	PF-020-020	1-1/4” Polypro PVC Pipe	1	
3	HE-020-007	1-1/4” Hose	1	
4	CL-032-005	2” Cam Plug	1	
5	CL-032-004	2” Plastic Female Cam Elbow	1	
6	PF-032-011	2” x 1-1/4” Poly Bushing	1	
7	PF-020-021	1-1/4” PVC Elbow	1	

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8 MAINTENANCE

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8.1 INSPECTION, SERVICE & MAINTENANCE CHARTS

You must inspect, maintain and service your trailer regularly to insure safe and reliable operation. If you cannot or are unsure how to perform the items listed here, have your dealer do them. Note: In addition to this manual, also check the relevant component manufacturer's manual.

Before Each Use And Periodically During Use		
Item	**Inspection / Service**	**Manual Section Reference**
Coupler and Hitch Ball	Check for cracks, pits, and flats. Replace w/ball & coupler having trailer GVW Rating. Grease. Check locking device & replace.	Section 4 & 8.2.2.1
Ring & Pintle	Check for cracks, pits, and flats. Replace w/ring & pintle having trailer GVW Rating. Grease. Check locking device & replace when worn.	Section 4 & 8.2.6.2
Safety Chains & Hooks	Check for wear and damage	Section 4
Tires	Check tire pressure when cold. Inflate to pressure indicated on VIN tag. Inspect tread and sidewalls thoroughly. Replace if worn or damaged.	Section 8.2.5
Wheels - Lug Nuts & Hub	Check for tightness Tighten. For new and remounted wheels, check torque after first 10, 25 & 50 miles of driving and after any impact.	Sections 5 & 8.2.9
Trailer Lights	Check all trailer lights for operation.	Section 4
Oil Vac Hoses, Fittings, Nozzles and Related Parts	Inspect all hoses for signs of damage, cracking and leakage. Inspect couplings for secure connections, damage and leakage. Inspect nozzles for proper operation, damage and missing parts. Drain water and inspect filter/separator for damage and leakage.	Section 8.3 Section 8.3 Section 8.3 Section 8.3
Compressor Engine	Inspect for proper oil level, operation, damage, missing parts and leakage.	Refer to the engine manual.
Compressor Pump and Tank Assembly	Inspect for proper oil level, operation, damage, missing parts and leakage.	Refer to the compressor manual.
Fire Extinguisher	Check for broken seal. Check pressure gauge/cylinder weight.	Refer to the fire extinguisher manual.

Inspection and Service Each Week		
Item	**Inspection / Service**	**Manual Section Reference**
Air Compressor Intake Filter(s)	Inspect for damage, dirt and debris	Refer to the compressor manual.

Every 3 Months or 1000 Hours of Usage		
Item	**Inspection / Service**	**Manual Section Reference**
Air Compressor Engine Oil	Change oil.	Refer to the engine manual.

Every 6 Months or 6,000 Miles		
Item	**Inspection / Service**	**Manual Section Reference**
Tires	Rotate @ 5,000 miles Inspect tread and sidewalls thoroughly. Replace tire when treads are worn, tire has a bulge or is damaged.	Section 8.2.5 Section 8.2.5 Section 8.2.5
Wheel Bearings	Lubricate	Section 8.2.8

Every Year or 12,000 Miles		
Item	**Inspection / Service**	**Manual Section Reference**
Jack	Lubricate	Section 8.2.3
Structure: Frame members Welds	Inspect all frame members, bolts & rivets. Repair or replace damaged, worn or broken parts. Inspect all welds. Repair as needed.	Section 8.2.1 Section 8.2.1.3
Wheels: Bearings Rims	Disassemble / inspect / assemble and repack. Replace promptly if immersed in water Inspect for cracks & dents. Replace as needed.	See Axle Mfr's Manual Section 8.2.6
Structure Axle Attachment Bolts	Check BY DEALER	Section 8.2.1

8.2 Inspection and Service Instructions

8.2.1 Axle Bolts, Frame, Suspension, & Structure

^ WARNING

Worn or broken suspension parts can cause loss of control and injury may result.

Have trailer professionally inspected annually and after any impact.

To perform many of the inspection and maintenance activities, you must raise the trailer.

When jacking and using jack stands, place them so as to clear wiring, brake lines, and suspension parts (springs, torsion bars, etc.). Place jacks and jack stands under the main frame rail to which the axles are attached.

^ WARNING

Never go under your trailer unless it is on firm and level ground and resting on properly rated, placed and secured jack stands.

8.2.1.1 CLEANING

Wash your trailer at least once per month, or more frequently as required. Clean up spilled substances immediately. Touch up paint nicks immediately.

8.2.1.2 FASTENERS AND FRAME MEMBERS

Inspect all of the fasteners and structural frame members for bending and other damage, cracks, or failure. Repair or replace any damaged fastener and repair the frame member. If you have any questions about the condition or method of repair of fasteners or frame members, get the recommendation of, or have the repair done by your dealer.

^ WARNING

Broken or damaged fasteners or welds can cause injury or damage to trailer and contents.

Inspect for, and repair all damaged parts at least once a year.

8.2.1.3 WELDS

All welds can crack or fail when subjected to heavy loads or movement of cargo that was not properly tied to prevent movement. To prevent severe damage to your trailer, inspect all of the welds for cracks or failure at least once a year.

^ WARNING

Improper weld repair will lead to early failure of the trailer structure and can cause serious injury or death.

Do not repair cracked or broken welds unless you have the skills and equipment to make a proper repair. If not, have the welds repaired by your dealer.

8.2.2 TRAILER CONNECTION TO TOW VEHICLE

COUPLER AND BALL

The coupler on the trailer connects to the ball attached to the hitch on the tow vehicle. The coupler, ball and hitch transfer the towing forces between the tow vehicle and the trailer. Before each tow, coat the ball with a thin layer of automotive bearing grease to reduce wear and ensure proper operation; and check the locking device that secures the coupler to the ball for proper operation.

If you see or feel evidence of wear, such as flat spots, deformations, pitting or corrosion, on the ball or coupler, immediately have your dealer inspect them to determine the proper action to prevent possible failure of the ball and coupler system. All bent or broken coupler parts must be replaced before towing the trailer.

The coupler handle lever must be able to rotate freely and automatically snap into the latched position. Oil the pivot points, sliding surfaces, and spring ends with SAE 30W motor oil. Keep the ball pocket and latch mechanism clean. Dirt or contamination can prevent proper operation of the latching mechanism.

When replacing a ball, the load rating must match or exceed the GVWR of the trailer.

8.2.2.1 RING AND PINTLE

The ring on the trailer connects to the pintle attached to the hitch on the tow vehicle. The ring, pintle and hitch transfer the towing forces between the tow vehicle and the trailer. Before each tow, coat the ring with a thin layer of automotive bearing grease to reduce wear and ensure proper operation; and check the locking device that secures the pintle to the ring for proper operation.

If you see or feel evidence of wear, such as flat spots, deformations, pitting or corrosion, on the ring or pintle, immediately have your dealer inspect them to determine the proper action to prevent possible failure of the ring and pintle system. All bent or broken coupler parts must be replaced before towing the trailer.

The pintle latch lever must be able to rotate freely. Oil the pivot points, sliding surfaces, and spring ends with SAE 30W motor oil. Keep the latch mechanism clean. Dirt or contamination can prevent proper operation of the latching mechanism.

When replacing a pintle, the load rating must match or exceed the GVWR of the trailer.

8.2.3 JACK

If a grease fitting is present, you must use a grease gun to lubricate the jack mechanism at least once a year.

8.2.4 LIGHTS AND SIGNALS

Before each tow, check the trailer taillights, stoplights, turn signals and any clearance lights for proper operation.

^ WARNING

Improper operating taillights, stoplights and turn signals can cause collisions.

Check all lights before each tow.

8.2.5 TIRES

Trailer tires may be worn out even though they still have plenty of tread left. This is because trailer tires have to carry a lot of weight all the time, even when not in use. It is actually better for the tire to be rolling down the road than to be idle. During use, the tire releases lubricants that are beneficial to tire life. Using the trailer tires often also helps prevent flat spots from developing.

The main cause of tire failure is improper inflation. Check the cold tire inflation pressures at least once a week for proper inflation levels. “Cold” means that the tires are at the same temperature as the surrounding air, such as when the vehicle has been parked overnight. Wheel and tire manufacturers recommend adjusting the air pressure to the trailer manufacturer’s recommended cold inflation pressure, in pounds per square inch (PSI) stated on the vehicle’s Federal Certification Label or Tire Placard when the trailer is loaded to its gross vehicle weight rating (GVWR). If the tires are inflated to less than the recommended inflation level or the GVWR of the trailer is exceeded, the load carrying capacity of the tire could be dramatically affected. If the tires are inflated more than the recommended inflation level, handling characteristics of the tow vehicle/trailer combination could be affected. Refer to the owner’s manual or talk to your dealer or vehicle manufacturer if you have any questions regarding proper inflation practices.

Tires can lose air over a period of time. In fact, tires can lose 1 to 3 PSI per month. This is because molecules of air, under pressure, weave their way from the inside of the tire, through the rubber, to the outside. A drop in tire pressure could lead to excessive heat build up. If a trailer tire is under-inflated, even for a short period of time, the tire could suffer internal damage.

High speed towing in hot conditions degrades trailer tires significantly. As heat builds up during driving, the tire's internal structure starts to breakdown, compromising the strength of the tire. It is recommended to drive at moderate speeds.

Statistics indicate the average life of a trailer tire is about five years under normal use and maintenance conditions. After three years, replacing the trailer tires with new ones should be considered, even if the tires have adequate tread depth. Some experts claim that after five years, trailer tires are considered worn out and should be replaced, even if they have had minimal or no use. This is such a general statement that it may not apply in all cases. It is best to have your tires inspected by a tire supplier to determine if your tires need to be replaced.

If you are storing your trailer for an extended period, make sure the tires are fully inflated to the maximum rated pressure and that you store them in a cool, dry place, such as a garage. Use tire covers to protect the trailer tires from the harsh effects of the sun.

^ WARNING

Worn, damaged or under-inflated tires can cause loss of control, resulting in damage, serious injury and possibly death.

Inspect tires before each tow.

8.2.6 WHEEL RIMS

If the trailer has been struck, or impacted, on or near the wheels, or if the trailer has struck a curb, inspect the rims for damage (i.e. being out of round); and replace any damaged wheel. Inspect the wheels for damage every year, even if no obvious impact has occurred.

8.2.7 WHEEL BEARINGS

A loose, worn or damaged wheel bearing is the most common cause of brakes that grab.

To check your bearings, jack up trailer and place on properly rated, placed and secured jack stands. Check wheels for side-to-side looseness. If the wheels are loose, or spin with a wobble, the bearings must be serviced or replaced. Refer to the axle manual for service procedures. If you do not have this manual, contact Sage Oil Vac or your dealer for assistance.

8.2.8 WHEEL LUG NUTS

Being sure wheel lug nuts on trailer wheels are tightened to the proper torque is an important responsibility that trailer owners and users need to be familiar with and practice. Inadequate and/or inappropriate wheel nut torque (tightness) is a major reason that lug nuts loosen in service. Loose lug nuts can rapidly lead to a wheel separation with potentially serious safety consequences.

Lug nuts are prone to loosen right after a wheel is mounted to a hub. When driving on a new or remounted wheel, check the lug nut tightness often during the first few hundred miles of the trailer's use, especially after the first 10, 25 and 50 miles of driving, before each tow, and at least twice per year thereafter.

^ WARNING

Lug nuts are prone to loosen after initial installation, which can lead to death or serious injury.

Check lug nuts for tightness on a new trailer or when wheel(s) have been remounted after the first 10, 25 and 50 miles of driving.

^ WARNING

Metal creep between the wheel rim and lug nuts will cause rim to loosen and could result in a wheel coming off, leading to death or serious injury.

Tighten lug nuts before each tow.

Tighten the lug nuts to the proper torque for the axle size on your trailer to prevent wheels from coming loose. Use a torque wrench to tighten the fasteners. The only way to be certain you have tightened the lug nuts properly is with a torque wrench. Four-way wrenches, ratchets, and similar tools can be useful for short-term emergency repairs, but are not appropriate tools for adequately tightening lug nuts. You must use a torque wrench to adequately indicate the torque that you are applying to the lug nut. Over-tightening can result in breaking the studs or permanently deforming the mounting stud holes in the wheels. Tighten per sequence in Figure 1. Using this sequence, tighten all lug nuts in three stages and to the torque values listed in Figure 2 for each stage.

Keep a record of the date and approximate mileage when you check the lug nut torque. Note any lug nut that is loose. Investigate the reason(s) if the lug nut tightness is not maintained after more than one re-tightening application, because this indicates there is something wrong with the lug nuts, studs, wheels and/or hubs and must be corrected.

Contact your dealer or vehicle manufacturer immediately if you experience any persistent lug nut loosening or any other lug, wheel or axle problems.

In the event of a wheel separation incident, notify the vehicle manufacturer and dealer. Seek prompt professional assistance in assessing the trailer. Retain, but don't re-use involved lugs, wheels and studs. Don't repair or service the trailer yourself. Call a trained technician.

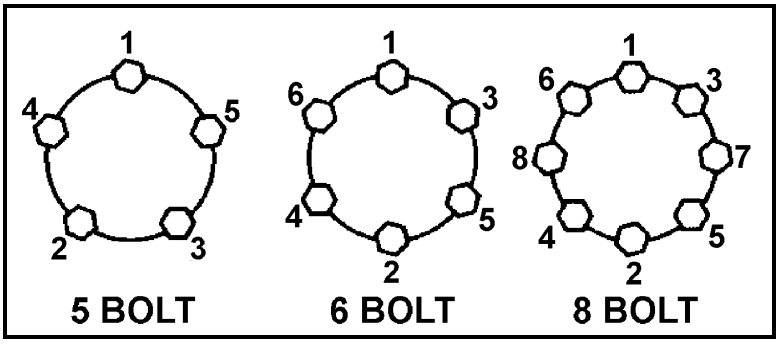


Figure 1 – Lug Tightening Sequence

Lug Nut Torque Values			
Bolt Pattern	1st Stage	2nd Stage	3rd Stage

5 and 6 Bolt	20-25 lb-ft	50-60 lb-ft	85-95 lb-ft
8 Bolt	20-25 lb-ft	50-60 lb-ft	105-115 lb-ft

Figure 2 – Lug Torque Requirements

8.3 Inspect Fluid Handling Equipment

^ WARNING

Risk of fire or explosion.

Do not smoke or use an open flame within 50 feet of the unit.

Verify that correct grounding procedures have been followed prior to operation.

If fluid is spilled, stop operation and notify safety personnel.

^ WARNING

Risk of hearing loss.

This machine produces extremely loud noise.

Hearing protection is required while operating this machine.

^ WARNING

Pressure hazard.

Relieve pressure before filling product tanks.

Failure to do so could cause serious injury.

^ WARNING

Burn hazard.

Hoses and fittings may be extremely hot during operation

Contact with these parts may cause serious burns.

8.3.1 Hoses, Fittings and Nozzles

Visually inspect all hoses for damage, cracking and signs of leakage. Inspect all couplings for secure connections,

damage and signs of leakage. Replace damaged or leaking parts before using the equipment.

Visually inspect all nozzles for proper operation, damage, signs of leakage and missing parts. Replace parts that do not operate properly, damaged or leaking parts before using the equipment.

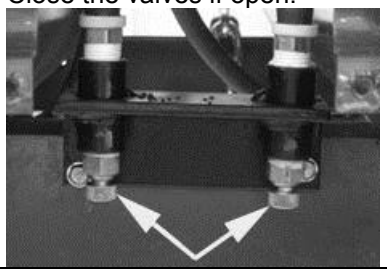
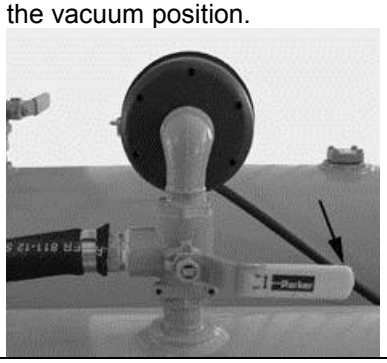
8.3.2 INSPECT FILTER/SEPARATOR

Drain any accumulated water in the filter/separator before each use. Visually inspect the filter/separator for signs of leakage or damage. Check for proper operation. Replace filter/separator if not operating properly, damaged or leaking before using the equipment.

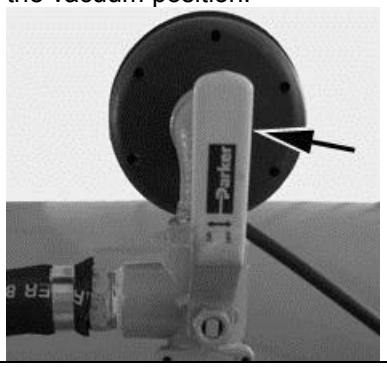
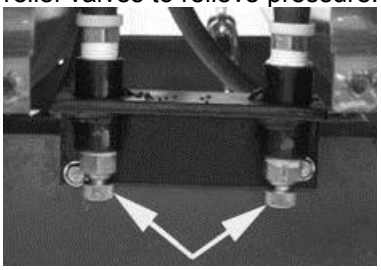
9 TROUBLESHOOTING

9 Troubleshooting 1
9.1 Air Compressor Will Not Build Air Pressure 2
9.2 Can Not Build Vacuum In Used Oil Tank 2
9.3 Used Oil Vacuum Is Very Slow 3
9.4 New Oil Delivery Is Very Slow 3
9.5 Vacuum Less Than 10” In Used Oil Tank 4

9.1 Air Compressor Will Not Build Air Pressure

1. Verify that the compressor relief valves are closed.	Close the valves if open. 	Does system build air pressure? Yes – Done No – Go to step 2.
2. Verify that the system is in the vacuum mode.	Check that the 3-way valve is in the vacuum position. 	Does system build air pressure? Yes – Done No – Go to step 3.
3. Are there any other items to check?		

9.2 Cannot Build Vacuum In Used Oil Tank

1. Verify that system is in the vacuum mode.	Check that the 3-way valve is in the vacuum position. 	Does system build vacuum? Yes – Done No – Go to step 2.
2. Does the air compressor run at full speed or idle?	If at an idle, open compressor relief valves to relieve pressure.  If at full speed, Go to step 3.	Does system build vacuum? Yes – Done No – Go to step 3.

3. Are the following ball valves closed? - Used filter receptacle sump valve - ¼" ball valve to pressurized used oil tank - Ball valve at end of used oil hose - Offload valve at bottom of used oil tank	Close the open valves.	Does system build vacuum? Yes – Done No – Contact Sage Oil Vac for assistance.

9.3 Used Oil Vacuum Is Very Slow

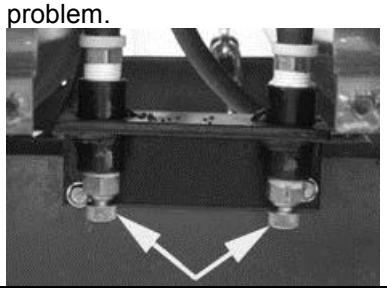
1. Is the equipment oil cold?	Change the oil shortly after engine has been running or run the engine to warm oil to at least 100 degrees F.	Is vacuum normal? Yes – Done No – Go to step 2.
2. Is the vacuum hose fully immersed in the fluid?	Verify that no air is being vacuumed from the source.	Is vacuum normal? Yes – Done No – Go to step 3.
3. Are the used oil hoses restricted?	Check for foreign objects and debris in the used oil hose and connections. If you feel this has occurred, you can pressurize the used oil tank and open the ball valve at the end of the used oil hose. **^ WARNING** **Please be aware that oil and other foreign objects may come out of the used oil hose with force.** **It is good practice to use the used filter receptacle as the collection point for this process**.	Is vacuum normal? Yes – Done No – Go to step 4.
4. Is the drain pan or quick connect fittings restricted?	Check for foreign objects and debris in the drain pan and fittings. Remove any foreign objects or debris.	Is vacuum normal? Yes – Done No – Contact Sage Oil Vac for assistance.

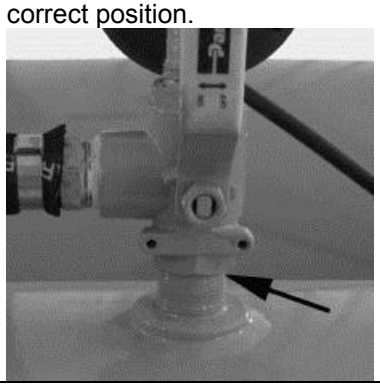
9.4 New Oil Delivery Is Very Slow

1. Is no-drip end on meter open?	Verify that the meter tip is in the full open position.	Is delivery normal? Yes – Done No – Go to step 2.
2. Is new product ball valve fully open?	Verify that the new product ball valve is in the full open position.	Is delivery normal? Yes – Done No – Go to step 3.
3. Are the quick connects or meter restricted?	Remove the quick connect fitting from the end of the hose and ensure that there is no foreign material restricting flow.	Is delivery normal? Yes – Done No – Go to step 4.

	Also, quick connect fittings cause pressure drop and will slow down the flow. If necessary, remove the quick connect fittings and plumb the handheld meter or dispensing device into the ball valve at the end of the hose. Ensure that meter does not have restriction on inlet side.	
4. Is there ample pressure in the new product tank?	Sage Oil Vac recommends dispensing fresh fluid at pressure as low as 10 psi and as high as 130 psi. If flow is slower than expected try putting more air pressure in the new product tank in which you are dispensing. It may be necessary to adjust the Air Regulator on the system which is factory preset at 60 psi.	Is delivery normal? Yes – Done No – Go to step 5.
5. Are filters restricted?	Sage Oil Vac recommends changing fresh fluid filters once or twice per year; however, it may become necessary to change these filters more often or after an event of fresh fluid with foreign material.	Is delivery normal? Yes – Done No – Contact Sage Oil Vac for assistance.

9.5 Vacuum Less Than 10” In Used Oil Tank

1. Is used product hose ball valve open?	Verify that this valve is closed.	Is vacuum normal? Yes – Done No – Go to step 2.
2. Is ¼ inch air inlet on used product tank closed?	Verify that this valve is closed.	Is vacuum normal? Yes – Done No – Go to step 3.
3. Are compressor relief valves open?	Verify these valves are open allowing compressed air to escape from compressor holding tanks. If the air compressor goes into idle or bypass mode before vacuum is achieved, this is probably the problem. 	Is vacuum normal? Yes – Done No – Go to step 4.

4. Check used product backflow prevention valve.	Your Sage Oil Vac system has a used oil backflow prevention valve located between the 3 way valve and the opening in the used oil tank. The valve is designed to keep the used oil tank becoming full and vacuuming fluid into the compressor. It may be possible that the check valve ball is lodged in the “up” position, thus preventing the system from making vacuum in vacuum mode. With the used oil tank at 0 pressure and the air compressor turned off, firmly tap the 3 way valve located on top of the used oil tank. This causes the ball to drop into the correct position. 	Is vacuum normal? Yes – Done No – Go to step 5.
5. Is the used filter receptacle valve open?	On the used product tank is a 3-way ball valve which controls the suction of the used filter receptacle. If this valve is left open, the user will not be able to achieve the desired amount of vacuum.	Is vacuum normal? Yes – Done No – Contact Sage Oil Vac for assistance.

10 Used Oil Disposal Information 1
10.1 Disposal Of Fluids And Waste 2

10.1 Disposal Of Fluids And Waste

Improperly disposed of fluids and waste can be harmful to the environment. Do not pour waste on the ground, down a drain or into a water source.

Consult with your local state agencies and the U.S. Environmental Protection Agency to determine what regulations and laws apply to you and/or your business concerning the transport and disposal of fluids and waste.

State	Agency Name	Website	Phone
Alabama	Alabama Department of Environmental Management	http://www.adem.state.al.us/	(334) 271-7700
	Alabama Department of Cons. & Natural Resources	http://www.outdooralabama.com/	(334) 242-3486
Alaska	Alaska Department of Environmental Conservation	http://www.dec.state.ak.us/	(907) 465-5066
Arizona	Arizona Department of Environmental Quality	http://www.azdeq.gov/	(800) 234-5677
	Arizona Fish & Game Department	http://www.gf.state.az.us/	(602) 942-3000
Arkansas	Arkansas Department of Environmental Quality	http://www.adeq.state.ar.us/	(608) 266-2621
California	California Air Resources Board	http://www.arb.ca.gov/homepage.htm	(800) 242-4450
	California Department of Conservation	http://www.consrv.ca.gov/index/	(916) 322-1080
	California Department of Toxic Substances Control	http://www.dtsc.ca.gov/	(800) 728-6942
	California Department of Water Resources	http://wwwdwr.water.ca.gov/	(916) 653-6192
	California Environmental Protection Agency	http://www.calepa.ca.gov/	(916) 323-2514
	California Integrated Waste Management Board	http://www.ciwmb.ca.gov/	(916) 341-6300
Colorado	Colorado Revised Statutes Online		
	http://www.state.co.us/gov_dir/leg_dir/olls/HTML/colorado_revised_statutes.htm		(303) 866-2045
	Colorado Department of Public Health & Environment	http://www.cdphe.state.co.us/index.html	(303) 692-2000
Connecticut	Connecticut Department of Environmental Protection	http://www.ct.gov/dep/site/default.asp	(860) 424-3000
Delaware	Delaware Dept. of Natural Resources & Env. Control	http://www.dnrec.delaware.gov/	(302) 739.9400
D.of Columbia	DC Dept. of Health's Environmental Health Admin	http://doh.dc.gov/doh/site/default.asp?dohNav_GID=1787	
			(202) 671-5000
Florida	Florida Department of Environmental Protection	http://www.dep.state.fl.us/	(850) 245-2118
Georgia	Georgia Department of Natural Resources	http://www.gadnr.org/	(404) 656-3500
	Georgia Environmental Protection Division	http://www.gaepd.org/	(404) 656-4863
Hawaii	Hawaii Department of Land & Natural Resources	http://www.hawaii.gov/dlnr/	(808) 587-0320
Idaho	Idaho Department of Environmental Quality	http://www.deq.state.id.us/	(208) 373-0502
	Idaho Department of Water Resources	http://www.idwr.state.id.us/	(208) 287-4800
Illinois	Illinois Environmental Protection Agency	http://www.epa.state.il.us/	(888) 372-1996
	Illinois Pollution Control Board	http://www.ipcb.state.il.us/	(217) 524-8500
Indiana	Indiana Department of Environmental Management	http://www.ai.org/idem/	(317) 232-8603
	Indiana Department of Natural Resources	http://www.state.in.us/dnr/	(317) 232-4200
Iowa	Iowa Department of Natural Resources	http://www.iowadnr.com/	(515) 281-5918
Kansas	Kansas Department of Health & Environment	http://www.kdheks.gov/	(785) 296-1500
Kentucky	Kentucky Environmental Quality Commission	http://www.eqc.ky.gov/	(502) 564-3410
	Kentucky Department for Natural Resources	http://www.dnr.ky.gov/	(502) 564-6940
	Kentucky Department for Environmental Protection	http://www.dep.ky.gov/	(502) 564-2225
Louisiana	Louisiana Department of Environmental Quality	http://www.deq.louisiana.gov/portal/	(225) 219-5337
Maine	Maine Department of Environmental Protection	http://www.maine.gov/dep/index.shtml	(207) 287-7688
Maryland	Maryland Department of the Environment	http://www.mde.state.md.us/	(410) 537-3000
	Maryland Department of Natural Resources	http://www.dnr.state.md.us/sw_index_flash.asp	(410) 260-8367
Mass.	Mass. Department of Environmental Protection	http://www.mass.gov/dep/dephome.htm	(617) 292-5500
Michigan	Michigan Department of Environmental Quality	http://www.michigan.gov/deq	(517) 373-7660
Minnesota	Minnesota Department of Natural Resources	http://www.dnr.state.mn.us/index.html	(651) 296-6157
	Minnesota Pollution Control Agency	http://www.pca.state.mn.us/	(651) 296-6300
Mississippi	Mississippi Dept. of Environmental Quality		
	http://www.deq.state.ms.us/MDEQ.nsf/page/Main_Home?OpenDocument		(601) 961-5171
Missouri	Missouri Department of Natural Resources	http://www.dnr.mo.gov/	(800) 361-4827
	Missouri Department of Conservation	http://mdc.mo.gov/	(573) 751-4115
Montana	Montana Department of Environmental Quality	http://www.deq.state.mt.us/index.asp	(406) 444-2929
	Montana Natural Resource Information System	http://nris.mt.gov/	(406) 444-3115
	Montana GIS Data Library	http://nris.mt.gov/gis/default.asp	(406) 444-7693
Nebraska	Nebraska Department of Environmental Quality	http://www.deq.state.ne.us/	(402) 471-2186
Nevada	Nevada Division of Forestry	http://www.forestry.nv.gov/	(775) 684-2500
	Nevada Dept of Conservation and Natural Resources	http://dcnr.nv.gov/	(775) 684-2700

.....	Nevada Division of Environmental Protection	http://ndep.nv.gov/	(775) 687-9366
N. Hampshire .	New Hampshire Department of Environmental Services .	http://www.des.state.nh.us/	(603) 271-3503
New Jersey.....	New Jersey Department of Environmental Protection.....	http://www.state.nj.us/dep/	(877) 927-6337
New Mexico....	New Mexico Environment Department.....	http://www.nmenv.state.nm.us/	(505)827-2855
New York.....	New York State Dept of Environmental Conservation.....	http://www.dec.state.ny.us/	(518) 402-8013
North Carolina	NC Department of Environment & Natural Resources	http://www.enr.state.nc.us/	(919)733-4984
.....	NC Div. of Pollution Prev. & Envir. Assistance.....	http://www.p2pays.org/	(919) 715-6500
North Dakota ..	North Dakota State Water Commission	http://www.swc.state.nd.us/4dlink9/4dcgi/redirect/index.html	
.....	.....	.....	(701) 328-2750
.....	North Dakota Geological Survey Division	https://www.dmr.nd.gov/ndgs/	(701) 328-8000
.....	ND Department of Health – Enviro. Health Section.....	http://www.health.state.nd.us/ehs/	(701) 328.5150
Ohio.....	Ohio Department of Natural Resources (ODNR)	http://www.dnr.state.oh.us/	(614) 265-6879
.....	Ohio Environmental Protection Agency.....	http://www.epa.state.oh.us/	(614) 644-3020
.....	Ohio Air Quality Development Authority.....	http://www.ohioairquality.org/	(614) 224-3383
Oklahoma.....	Oklahoma Conservation Commission	http://www.conservation.ok.gov/	(405) 521-2384
.....	Oklahoma Department of Environmental Quality	http://www.deq.state.ok.us/	(405) 702-1000
Oregon	Oregon Department of Environmental Quality	http://www.oregon.gov/DEQ/	(503) 229-5696
.....	Oregon Department of Fish & Wildlife.....	http://www.dfw.state.or.us/	(503) 947-6000
Pennsylvania ..	Pennsylvania Department of Environmental Protection ...	http://www.depweb.state.pa.us/dep/site/default.asp	
.....	.....	.....	(717) 787-2814
.....	Pennsylvania Dept. of Cons. & Natural Resources.....	http://www.dcnr.state.pa.us/	(717) 772-9084
Rhode Island ..	Rhode Island Dept of Environmental Management.....	http://www.dem.ri.gov/	(401) 222-6800
S Carolina.....	S Carolina Dept. of Health & Environmental Control.....	http://www.scdhec.net/	(803) 898-3432
.....	South Carolina Department of Natural Resources	http://www.dnr.sc.gov/	(803) 734-9101
South Dakota..	S Dakota Dept. of Environment & Natural Resources.....	http://www.state.sd.us/denr/denr.html	(605) 773-3151
Tennessee.....	Tennessee Dept. of Environment & Conservation	http://www.tennessee.gov/environment/	(615) 532-0109
Texas.....	Texas Commission on Environmental Quality (TCEQ)	http://www.tceq.state.tx.us/	(512) 239-1000
.....	City of Dallas Air Pollution Control	http://www.dallasair.org/	(214) 948-4435
Utah.....	Utah Department of Environmental Quality.....	http://www.deq.utah.gov/	(800) 458-0145
.....	Utah Automated Geographic Reference Center (AGRC).	http://agrc.its.state.ut.us/	(801) 538-3665
Vermont.....	Vermont Agency of Natural Resources.....	http://www.anr.state.vt.us/	(802) 241-3600
Virginia	Virginia Department of Environmental Quality.....	http://www.deq.virginia.gov/	(804) 698-4000
Washington	Washington State Department of Ecology	http://www.ecy.wa.gov/	(800) 917-0043
.....	Washington State Department of Natural Resources.....	http://www.dnr.wa.gov/	(360) 902-1004
.....	Washington Dept. of Trans. Environmental Services.....	http://www.wsdot.wa.gov/environment/default.htm	
.....	.....	.....	(360) 705-7000
West Virginia ..	West Virginia Division of Environmental Protection.....	http://www.wvdep.org/	(304) 926-0440
Wisconsin.....	Wisconsin Department of Natural Resources	http://www.dnr.state.wi.us/	(608) 266-2621
.....	Wisconsin DNR Environmental Protection	http://dnr.wi.gov/environmentprotect/index.html	(608) 266-2621
Wyoming	Department of Environmental Quality	http://deq.state.wy.us/	(307) 777-7937